VERY LATEST METHODS

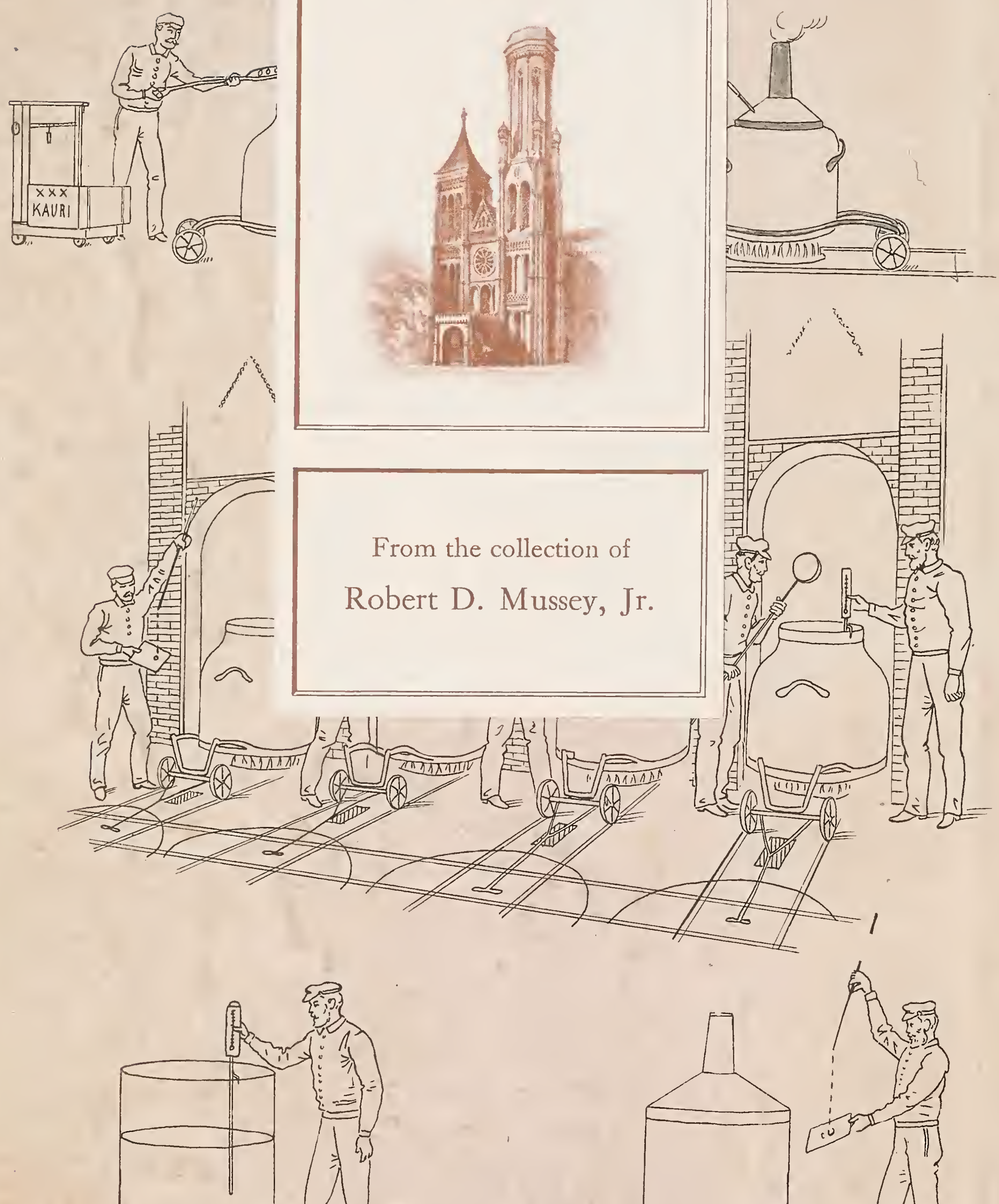
Special Formulas and Standard Processes

SECURED IN

FRANCE, ENGLAND, BELGIUM AND GERMANY,

FOR THE MANUFACTURE OF

VARNISHES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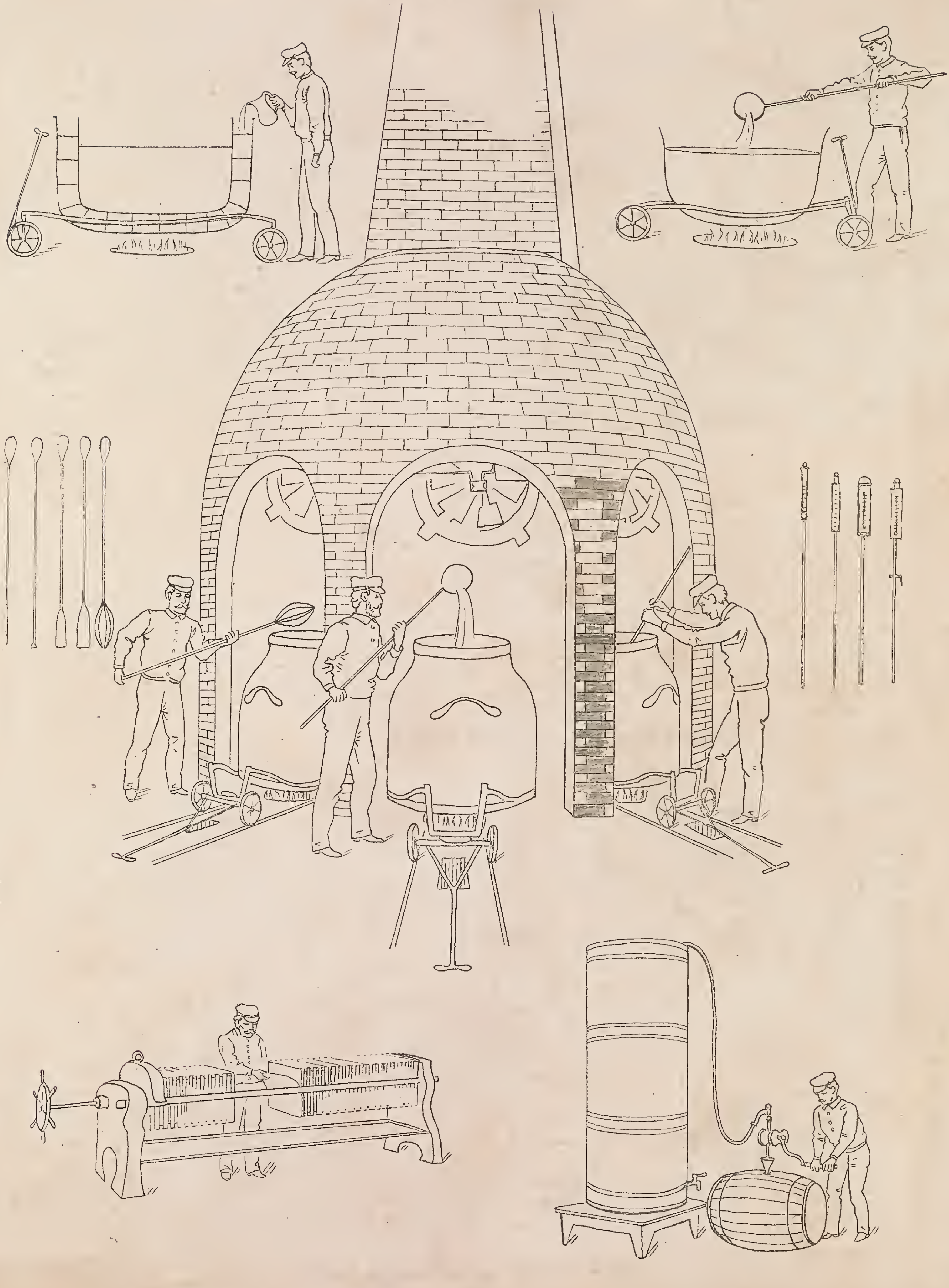

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The accumulative knowledge and experience of the OLD and the NEW WORLD in the PRACTICAL MANUFACTURE OF VARNISHES, Cover HUNDREDS OF TECHNICAL QUESTIONS, SPECIAL SUBJECTS and DIFFICULT PROBLEMS, presenting such interest to the PRACTICAL VARNISH MAKER that each question well deserves being CONSIDERED and STUDIED separately.

PRACTICAL VARNISH MAKING cannot be learned in BOOKS, PAMPHLETS or TRADE JOURNALS; neither can it be learned in the MELTING ROOM OF A VARNISH FACTORY only and exclusively.

All that is known up to date about VARNISH MAKING, either SCIENTIFICALLY, TECHNICALLY or PRACTICALLY, can be classified into two great divisions:

1st. THE SCIENCE OF VARNISH MAKING.

2nd. THE ART OF VARNISH MAKING.

Every subject, question or item interesting the Varnish maker, and having a direct or indirect bearing upon the SCIENCE OF VARNISH MAKING or the ART OF VARNISH MAKING, will be found properly classified and conveniently indexed in the following pages.

The SCIENCE OF VARNISH MAKING is itself subdivided into Twenty Parts, each one of them embodying a great number of technical questions and difficult problems generally ill understood by the operative Varnish maker and upon which more light is needed.

The ART OF VARNISH MAKING, which constitutes the second great division of this work, like the SCIENCE OF VARNISH MAKING, is also subdivided into Twenty Parts, embodying first all the results of the author's experience in the production of the finest as well as the most economical goods. This work is furthermore the most complete, elaborate and the only existing compilation of the best results obtained by competent Varnish makers of the old and the new school.

In the SCIENCE OF VARNISH MAKING and the ART OF VARNISH MAKING will be found the very latest methods, special formulas and standard processes adopted in France, England, Belgium, Germany and the United States, for the manufacture of VARNISHES, PREPARED OILS, OXIDIZING COMPOUNDS, DRYERS, JAPANS, VEHICLES, SOLVENTS, ECONOMICAL SUBSTITUTE STAINS, THINNERS, DILUENT S and LACQUERS.

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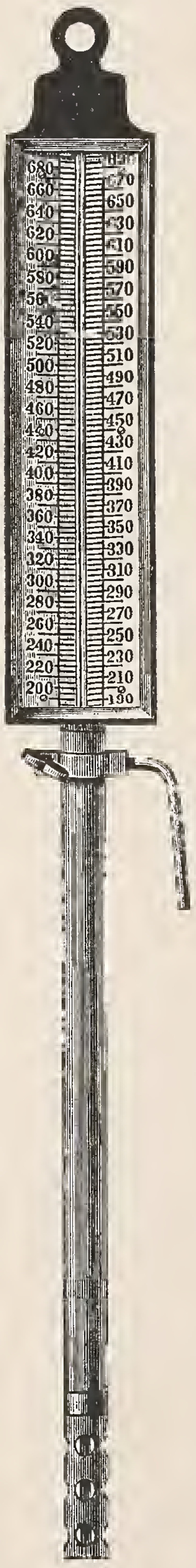

THE SCIENCE OF VARNISH MAKING.

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All questions bearing directly or indirectly upon the SCIENCE OF VARNISH MAKING, can be subdivided into Twenty Chapters:

IST QUESTIONS OF TEMPERATURE.

2ND. QUESTIONS OF KETTLES AND FACTORY APPLIANCES.

3RD. QUESTIONS OF VARNISH GUMS CONSIDERED AS RAW MATERIALS.

4TH OXIDIZING AGENTS, CHEMICAL DRYERS AND INERT MATERIALS.

5TH QUESTIONS OF SOLVENTS, VEHICLES AND THINNERS.

6TH QUESTIONS OF DEODORIZING VEHICLES AND SOLVENTS.

7TH QUESTIONS ON LINSEED OIL CONSIDERED AS A RAW MATERIAL.

8TH QUESTIONS OF BLEACHING OR REFINING LINSEED OIL.

9TH QUESTIONS OF BLEACHING OR REFINING VARNISH GUMS AND RESINS.

10TH QUESTIONS CONCERNING THE TREATMENT AND HARDENING OF ROSIN.

11TH QUESTIONS OF MELTING AND BLENDING VARNISH GUMS.

12TH QUESTIONS OF COOKING OILS AND GUMS.

13TH QUESTIONS OF OXIDIZING OILS, GUMS AND RESINS.

14TH QUESTIONS OF THINNING DOWN.

15TH QUESTIONS OF FILTERING AND CLARIFYING RAPIDLY VARNISHES.

16TH QUESTIONS OF COLORATIONS, NATURAL AND ARTIFICIAL.

17TH QUESTIONS OF FLOWING AND BODYING.

18TH QUESTIONS OF WEAR AND DURABILITY IN A VARNISH.

19TH QUESTIONS CONCERNING THE RIPENESS OR MATURATION OF A VARNISH.

20TH THE VARNISH MAKER'S LABORATORY AND EXPERIMENTING DEPARTMENT.

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Each one of the above 20 Chapters can be subdivided as follows:

PART No. I

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF TEMPERATURE.

Part No. I.

QUESTIONS OF TEMPERATURE.

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No. of the Subject.

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Subject.

INFLUENCE OF THE TEMPERATURE

upon

THE RESULTS IN VARNISH MAKING.

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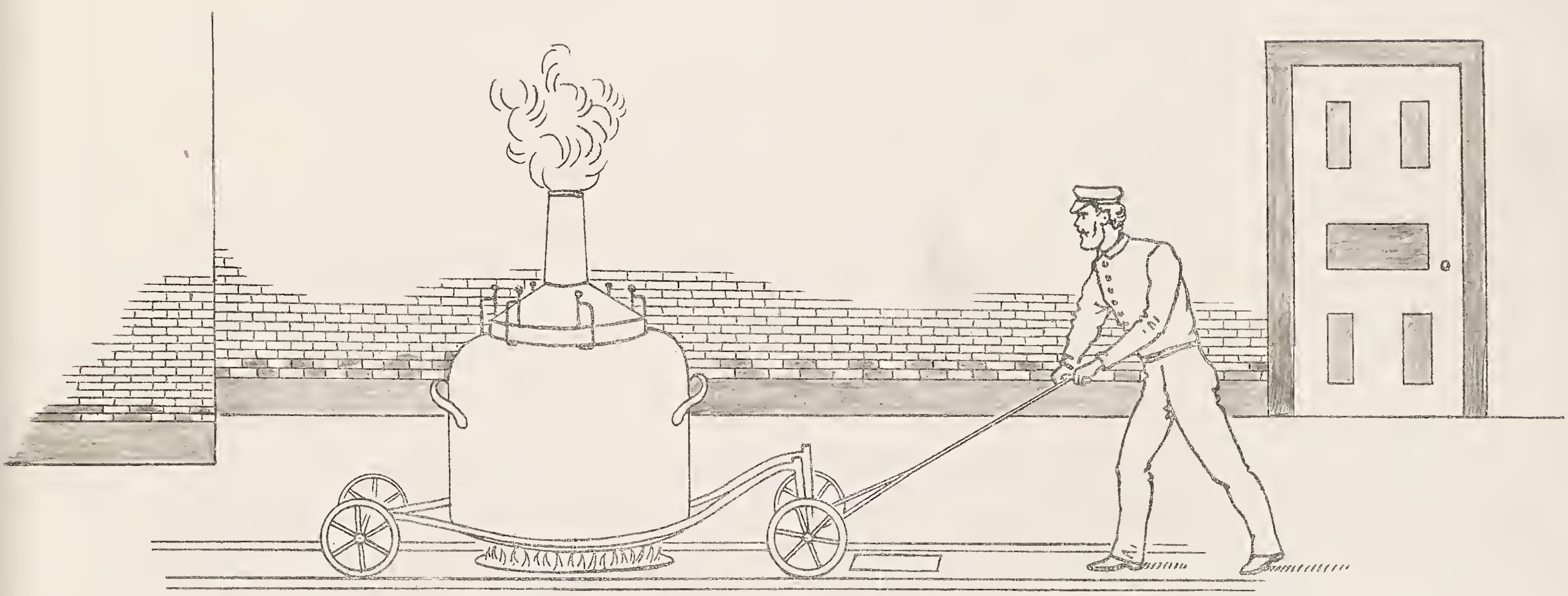
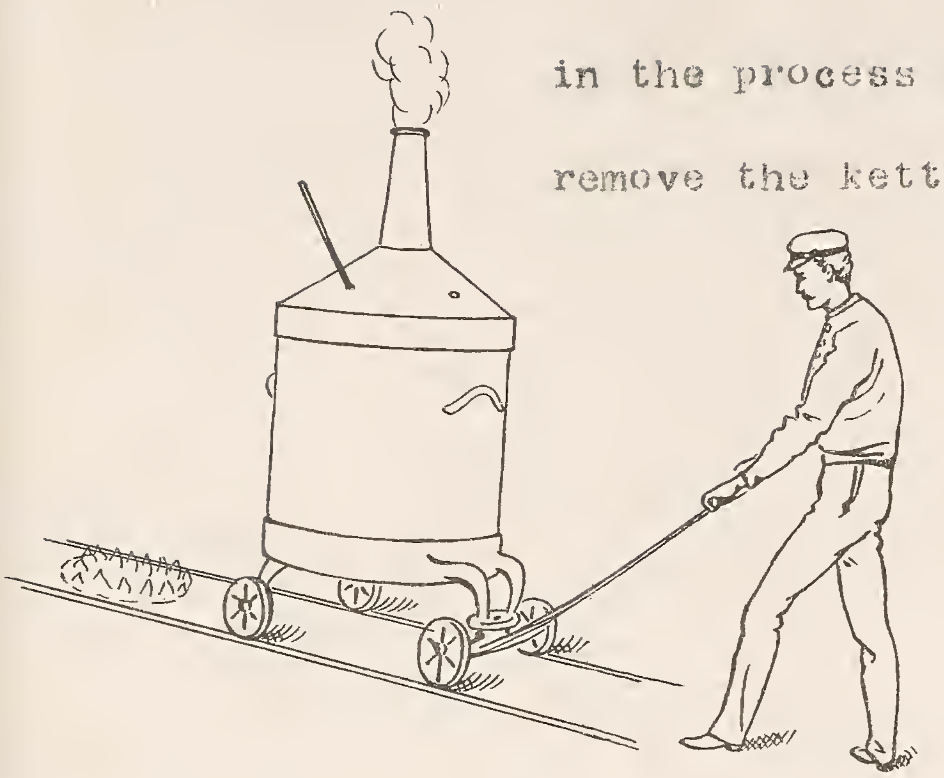
"1. The secret of making FAT VARNISHES exceedingly light in color, if not entirely colorless, rests chiefly upon the important question of a rational temperature in the treatment of the gums and the preparation of the oil.

By the use of the ordinary Varnish copper kettle resting upon an incandescent fire of coke, as per cut shown below, it is an



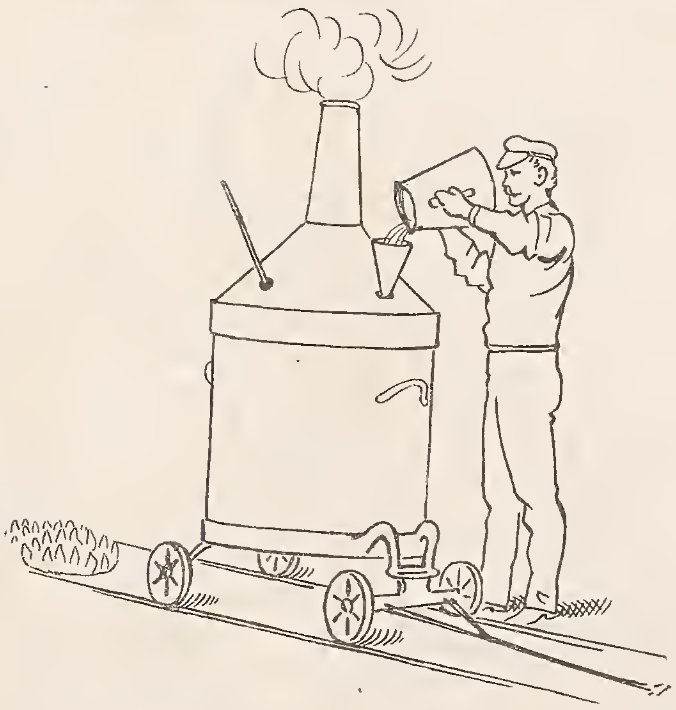
utter impossibility to insure an absolutely uniform temperature.

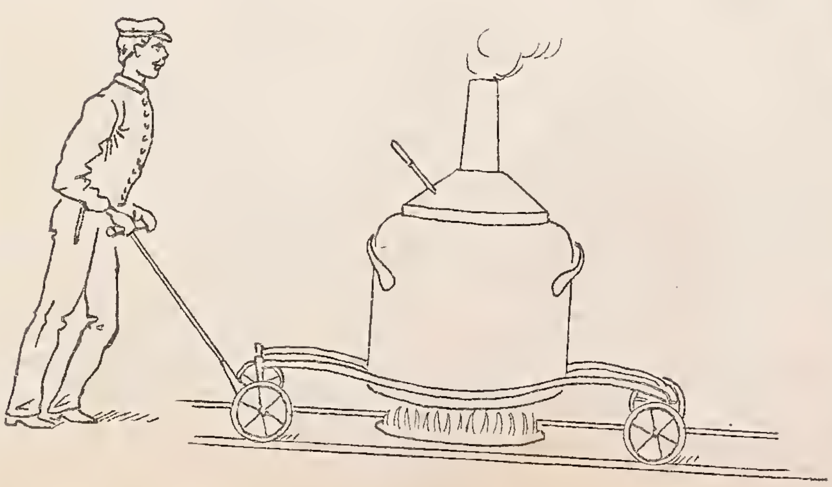
It is a fact well known that with a kettle such as this, owing to the tremendous heat developed by the coke fire and acting directly upon the bottom of the kettle, it is very often necessary



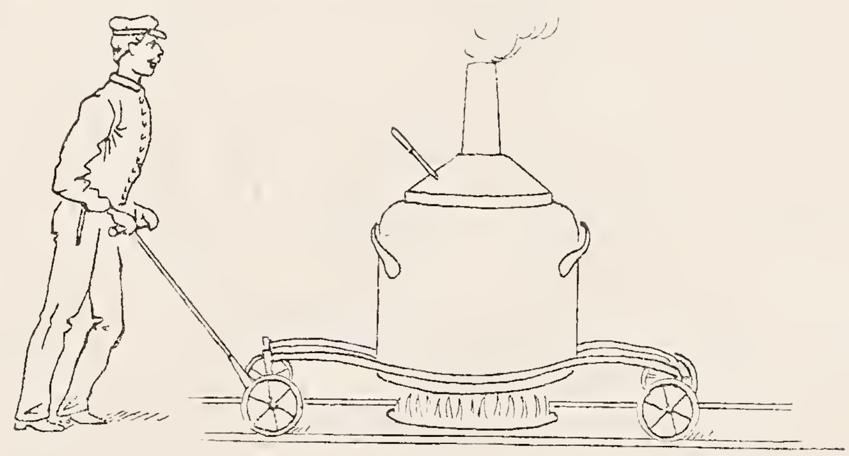
in the process of making a "BATCH" of Varnish, to remove the kettle from the fire place so as to avoid the danger of over heating, which in the majority of cases is the main cause of poor results and dark color.

#5. The operator must not lose sight of the fact that while his thermometer indicates for instance 450 deg. F. as being the temperature to which the oil is heated in the Varnish kettle, there is sometimes a heat as high as 1200 deg. F. developed by the fire underneath; so that part of the oil which is nearest to the fire and directly in contact with the excessive temperature of the bottom of the kettle, instead of being submitted as the thermometer indicates to 450 deg. F., in reality is submitted by contact with the red hot bottom of the copper kettle to a temperature exceeding 800 or 900 deg. F. To this is due mostly the great care and considerable experience, combined with skill, which is requred from the operator to make a good "BATCH" of Varnish.





#5. With an ordinary Varnish copper kettle having a single bottom and such as used in the majority of Varnish factories, it requires a life-time experience to conduct properly and to manage satisfactorily every detail of the operations in making a batch of Varnish from the beginning, or MELTING OF THE GUMS, to the last phase, or THINNING DOWN. In fact, with the best made single bottom copper kettle, Varnish making amounts to GUESS WORK; and there are so many ill understood causes which contribute to the uniformity of the result that there is not one Varnish maker out of a hundred who can flatter himself on being able to make two batches of Varnishes absolutely alike in FLOWING, DRYING and BODY or CONSISTENCY, no matter how careful he may be in carrying out every operation connected with the process.



From the aspect or the look of the surface of the liquid in the Varnish kettle, from its fluidity and the way it runs from the iron stirrer, from the color of the froth, from the density of the resinous fumes evaporating through the hood of the cover, from the acridity of the smell and from the size of the bubbles produced by the heating and coming to the surface of the Varnish,

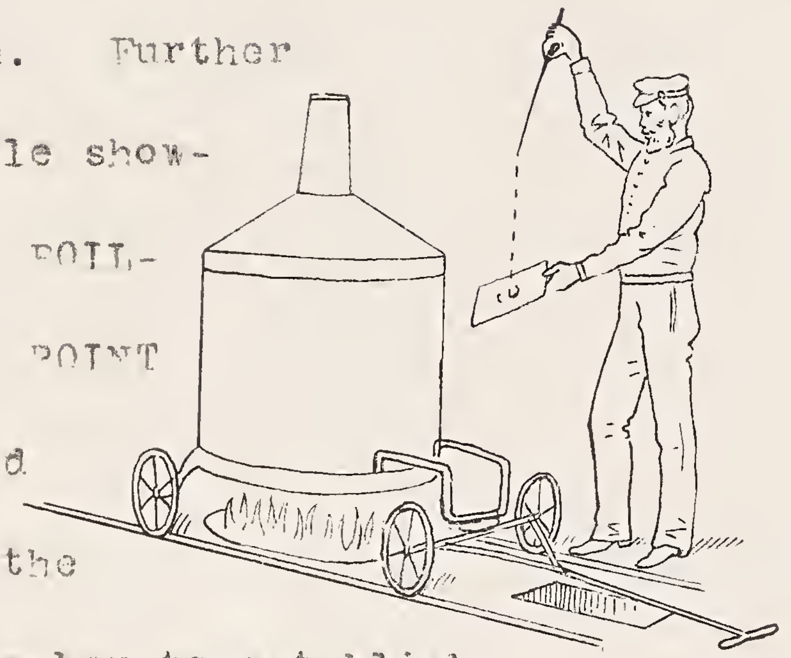
the experienced operator, without using any thermometer, must be able at any moment to see how far his "BATCH" of Varnish is progressing.

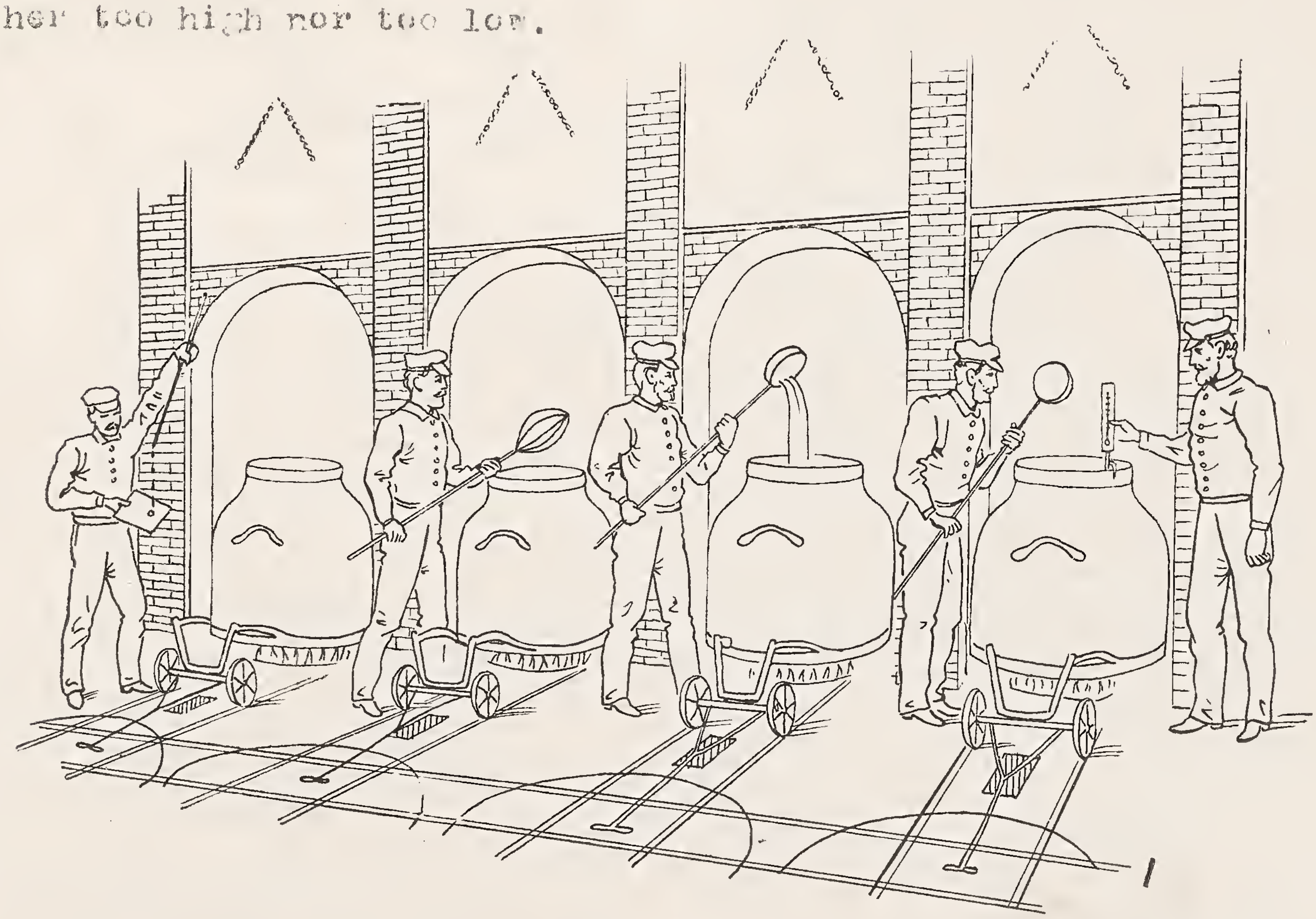
The use of the thermometer can only indicate, though very incorrectly, what is the temperature of the Varnish in the kettle just at the moment of examination; but the Varnish maker must use his own judgment as to the necessity of increasing or reducing the temperature, according to the stage of the operation.

Strange as it may appear first, the most important factor in the production of a faultless Varnish, the Varnish copper kettle such as it is generally made especially for Varnish makers, is unfit for the many requirements and technicalities of a perfect MELTING OF GUMS and COOKING OF THE VARNISH at a temperature ranging between the POINT OF FUSION of the gums and the BOILING POINT of the same gums.

As a general rule, and with but very few exceptions, a "Batch" of Varnish must be heated so that the COOKING be performed

at a temperature neither higher than the BOILING POINT of a liquified rosin or Varnish gum, nor lower than the MELTING POINT of said Rosin or Gum. Further on will be found a complete table showing comparatively the MELTING, the BOILING, the BURNING and the FLASHING POINT of all sorts of Varnish gums and resins accurately determined by the author so as to enable the Varnish maker to establish well defined rules in the practical use of his thermometer and in ascertaining whether or not he is conducting his "BATCH" of Varnish at a temperature neither too high nor too low.

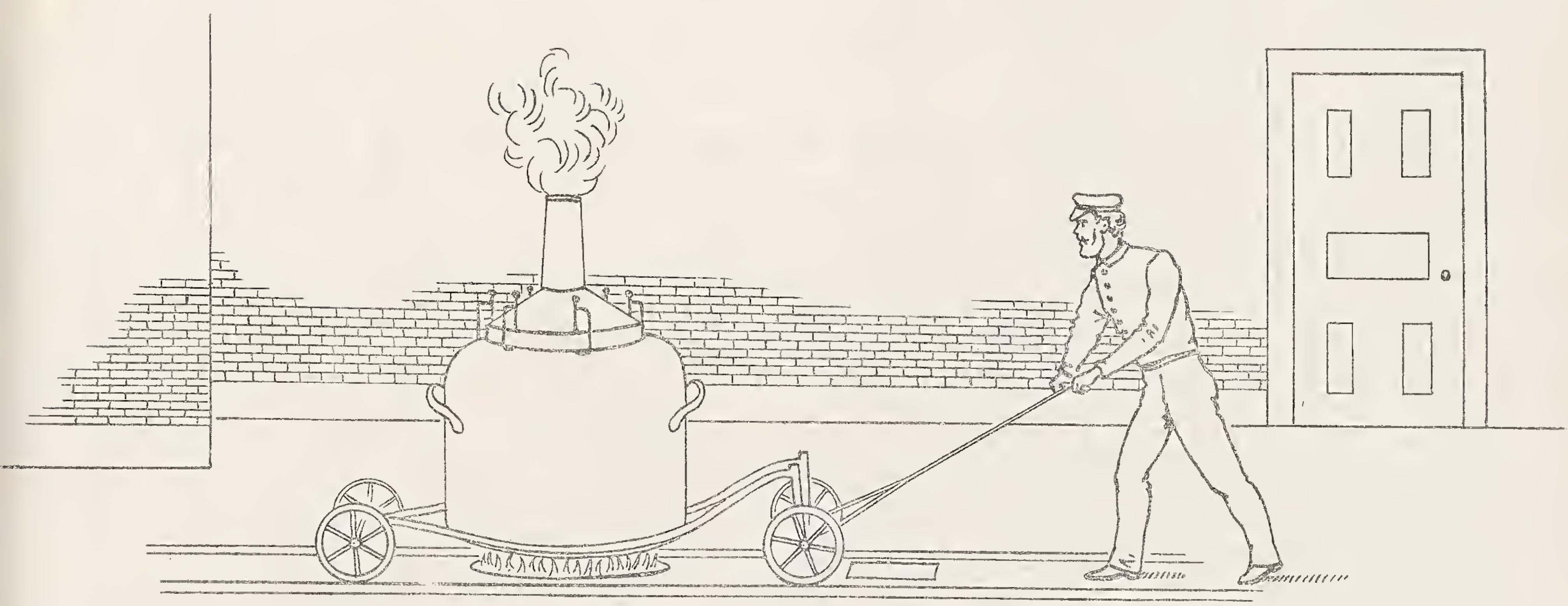




#10. By the use of any one of the four Varnish copper kettles

standing on fire as per cut (see previous page), every time that in the operator's judgment the preparation in the kettle shows a tendency of over-heating or a too rapid "COOLING", the kettle is then at once removed three to four feet from the fire place so as to be allowed to only simmer gently by the heat radiated from the coke fire. When the temperature has been lowered in this way, the kettle with its contents is then carried over again upon the fire place and submitted anew to the direct action of the heat produced by the incandescent coke fire.

How often, when, how long a kettle containing a Varnish preparation on fire should be removed from the fire and brought



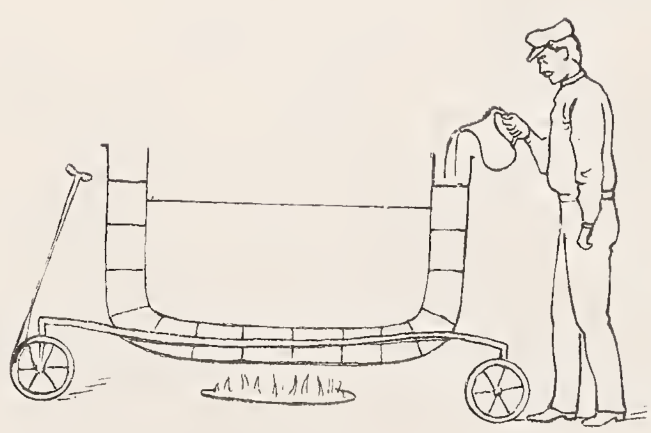
over it again, is something that only many years of experience can teach.

#20. The fact is that with a kettle such as the one above a Varnish maker must devote a lifetime to master questions which have but very little bearing on the true knowledge of the SCIENCE OF

VARNISH MAKING, and it seems somewhat strange, as it has been already said, that a more adequate receptacle than a Varnish kettle directly heated by an incandescent fire of coke has not been devised to simplify the very hard task of watching constantly the fire underneath the kettle without losing sight a moment of the preparation that is inside.

PRACTICAL VARNISH MAKING presents by itself enough difficulties of technical nature without purposely complicating it by the use of inadequate materials. The single bottom Varnish copper kettle does not answer at all the manifold requirements of MODERN VARNISH MAKING.

There is only one way to simplify the complications inherent to the use of a single bottom copper kettle in Varnish making; and this is by a more perfect regulation of the temperature,



which influence constitutes the most important factor in Varnish making. By the use of a double bottom Varnish kettle, constructed as per cut, all possible danger of over-heating an oil or burning a gum in the Varnish kettle, is entirely avoided.

PRECEPTS FROM VARNISH MAKERS OF THE OLD SCHOOL

compared with

PRECEPTS FROM VARNISH MAKERS OF THE NEW SCHOOL

regarding questions of temperature.

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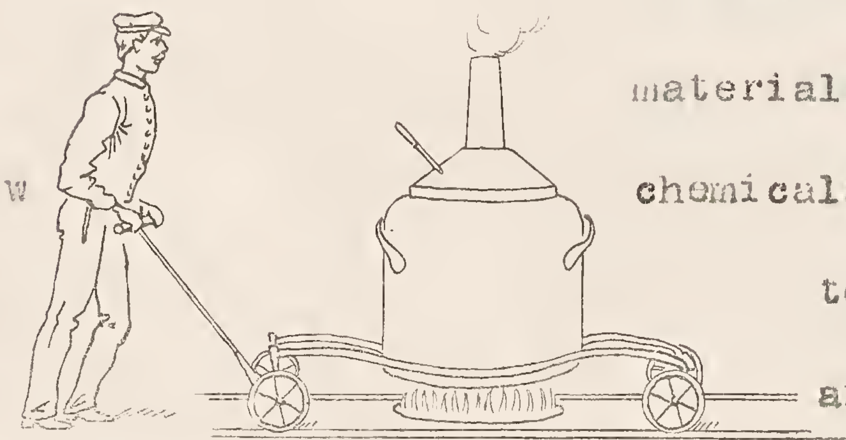
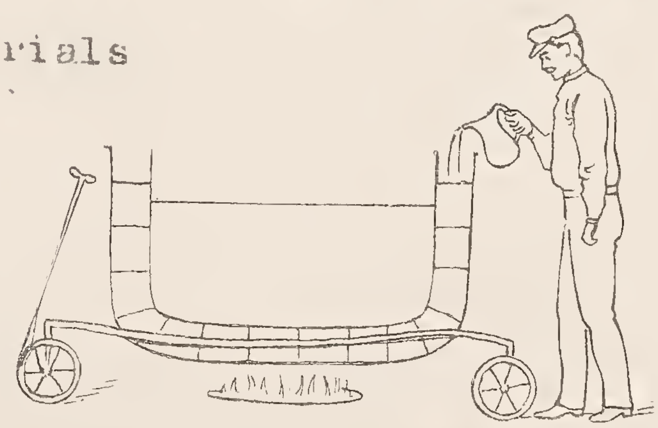
#30. In the practical manufacture of Varnishes, PROGRESS is going on every day slowly but steadily; the rapid advancement of modern science constantly suggests ingredients and new materials which heretofore were unknown; new chemicals, new agents of oxidation enable to get quicker results; but there are many things

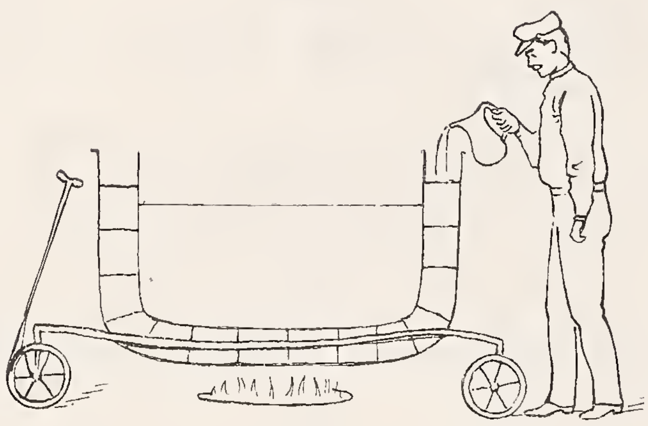


which unfortunately cannot be improved. Amongst them are the Varnish gums, the effect of oxygen and the Linseed Oil. Varnish kettles, from the earliest period of the history of Varnish making to only a few years ago, had been considered as belonging to the latter class of materials for working which could not be improved; after such a long standing, still, competent and progressive Varnish makers,



giving up the precepts of routine, have adopted the second kettle, as per cut, instead of the first one. From the very inter-

esting results which can be obtained with this new double kettle, and the far superior Varnish Oil which can be made almost colorless, the great defects of the old style single bottom Varnish kettle become more apparent. Skilled workmanship in melting gums and



preparing oils with a kettle as per cut are no longer an absolute necessity.

#55. It is not necessary either, with a double kettle such as the one above, to acquire a lifetime experience in conducting the fire before being able to produce a good Batch of Varnish. Through a very simple process, which will be at length explained in the chapter on "QUESTIONS OF VARNISH KETTLES", also in the chapter on "QUESTIONS CONCERNING THE OXIDATION OF OILS", all risks of over heating or "BREAKING" an oil are avoided; and in melting hard gums and making Varnishes, the questions of temperature are so well and uniformly regulated that FAT VARNISHES almost colorless can be made.

The old style kettle in general use in the majority of Varnish factories is constructed on the principle of "MELTING AND COOKING" through direct heat. The new style of double Varnish kettle is based upon the principle of INDIRECT HEATING.

MELTING AND COOKING GUMS AND OILS THROUGH DIRECT HEAT exposes the operator, no matter how careful he may be in heating, to produce an oil or a Varnish dark in color. Every Varnish maker knows well enough that an oil which has been overheated with or without chemicals, turns reddish or brownish in color; this being also the case with melted gums which have been overheated during the process of melting. It is not then possible to expect that a Varnish made from overheated ingredients will be light in color.

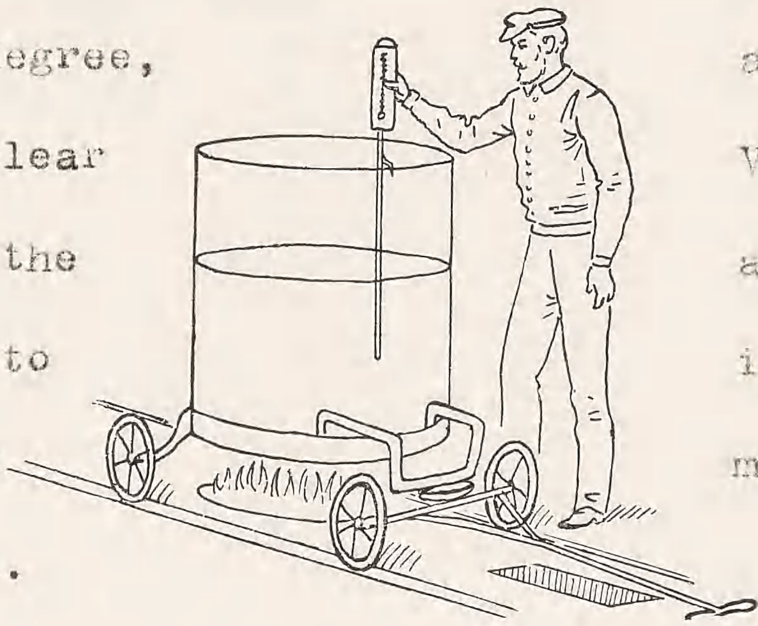
Melting and cooking gums and oils through direct heat and through the use of the ordinary single bottom Varnish copper kettle may give certain results to a certain extent satisfactory in color, body and drying, providing that the operator has had considerable experience as to the management of his fire. Fair looking Borate Oils have always been made in that way; but it may be said that in color they do not compare with the same Borate Oil made in a double kettle.

#40. According to precepts from Varnish makers of the old school, and especially ENGLISH VARNISH MAKERS, the real skill or talent of an operator in Varnish making entirely depends on his knowledge and experience in the management of his fire.

There is a point or degree of lightness in the preparation of oils which has been obtained through many years of experiment; still, it is generally admitted that the results thus obtained are not satisfactory as to color. There is a want for

something lighter.

All Varnishes, (as none is absolutely colorless) will change the color of the ground work to a greater or less degree, according to the number of coats of clear Varnish applied. And for this reason, the aim of the progressive Varnish maker is to improve the lightness of the color, and make, if possible, a colorless Varnish.

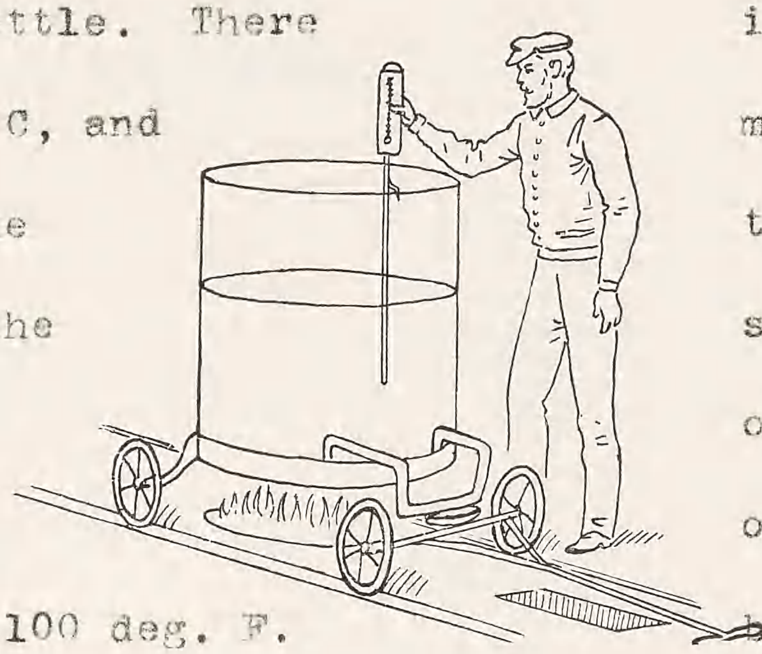


A glance at the above cut shows an oil heated to 450 deg. F. upon the fire place in an ordinary single bottom Varnish kettle, and will illustrate the fact that by the method of heating generally adopted, it is utterly impossible to control satisfactorily, manage or regulate the action of the temperature.

And effectively, while the most accurate thermometer indicates 450 deg. F. as being the exact temperature to which the oil has been heated, the plain fact is that the temperature developed by the fire underneath exceeds 1200 deg. F., and produces on the inside bottom of the kettle a heat of at least 1000 deg., or more than is necessary to burn that part of the Linseed Oil which is in contact with the bottom of the kettle.

On the other hand, we can notice that in making Varnishes by the method adopted in Varnish factories today, the tempera-

ture of the kettle is confined to a very limited part, or only to the bottom instead of being uniformly distributed as it ought to be all around the kettle. There is more heat in D than than there is in C, and much more in C than in B and A; while the temperature of the air in contact with the surface of the oil or Varnish is very often lower than 100 deg. F. Or in other words, there is a difference of 1100 deg. F. between the tempera-ture at the top and that at the bottom of the kettle.



How is it possible under these conditions to control the temperature so as to make two "BATCHES" of Prepared Oil or Varnish alike?

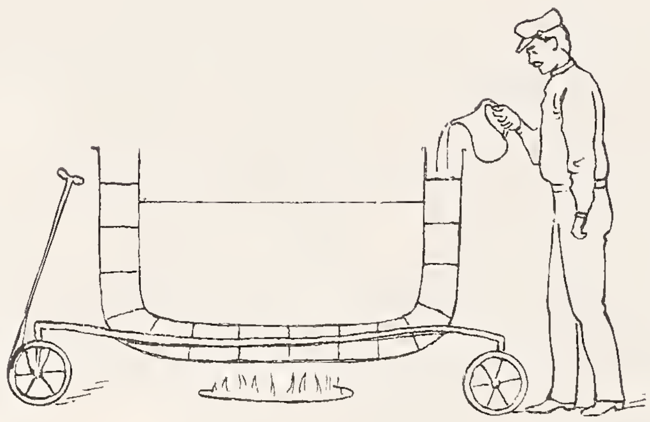
If the same causes always give the same results, the manufacture of Varnishes is certainly not an exception to the rule, and it may be said that an operator who has no control whatever of the element that contributes more directly than anything else to the uniformity of the results, ceases to deserve the qualification of being "skilfull" or "competent".

#45. It is impossible to deny that in the manufacture of Varnishes, trade secrets have existed and that some Varnish makers have become renowned through their ability to make their Varnish lighter, more durable, cheaper or better. Superiority can, in-deed, only be attributed to greater care and skill in carry-

ing out the various operations.

MELTING AND COOKING GUMS AND OILS THROUGH INDIRECT HEAT is the first precept from Varnish makers of the new school.

Experiments in making Varnishes are costly, and repeated



mistakes in attempting to get the desired results are ruinous.

It is a fact beyond doubt that experience is a correct teacher; but it is an expensive one, and there are already enough matters of technical character to be taken into consideration in the manufacture of Varnishes without complicating the problem every day with questions of mechanical nature that can be solved once for all in the preliminary organization of a Varnish factory.

The new style of double Varnish kettle, as per cut, simplifies to such an extent the manufacture of Varnishes of the highest grade, that through its use almost every risk of making an off color "BATCH" on account of over-heating is avoided.

In making low grade Varnishes, according to precepts of Varnish makers of the New School and by the use of the above kettle, it goes without saying that Varnishes exceedingly light in color cannot be expected from low grade gums or from gums having a

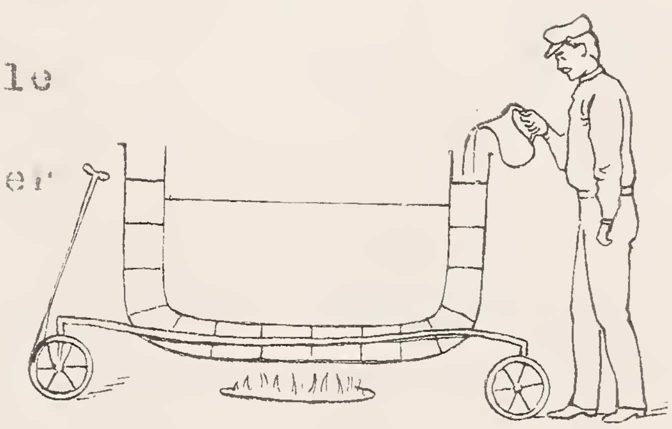
coloring principle; but there are causes entirely independent of the nature of the gum which affect the lightness of the color. First amongst them is the method adopted by Varnish makers for melting the gums through the action of direct heat.

#54. CAUSES OF VARNISHES AND PREPARED OILS NOT BEING LIGHT.

From what has been already said about questions of temperature, the causes of a Varnish or a Prepared Oil not being light depend entirely on the excessive temperature developed by the fire on the bottom of the kettle, which temperature is sufficient to burn partially the oil or the Varnish immediately in contact with the bottom.

#55. THEORY OF THE MANUFACTURE OF VARNISHES ACCORDING TO PRECEPTS OF VARNISH MAKERS OF THE NEW SCHOOL.

The new method of making Varnishes with the double kettle is based upon the principle of the water bath, with the difference that instead of using boiling water as in a water bath, or



superheated steam, as in the steam jacketed kettle, the source of heat is generated by a METAL IN FUSION or by PARAFFINE WAX heated to its BOILING POINT.

The outside kettle, A, is an ordinary iron kettle.

The inside kettle, B, is a copper kettle.

Capacity of the inside kettle, 100 gals.

The inside kettle is fastened to the iron kettle in A2- A3- A4- A5- D. F. G. H., so as to leave a space of two inches between the iron kettle A and the inside kettle B.

The space between the outside and the inside kettle is filled, according to the temperature desired, with one of the four following ingredients:

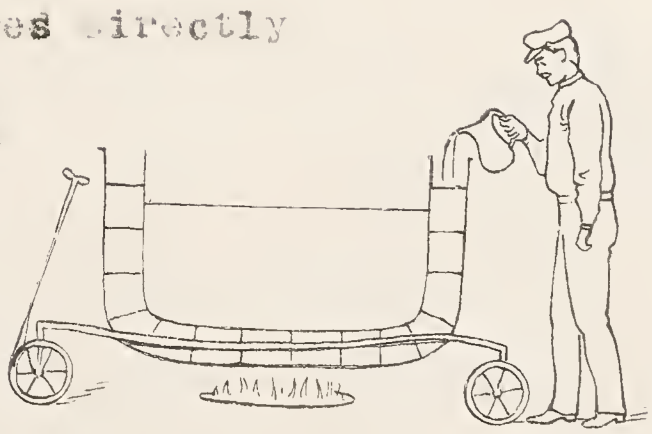
MELTED LEAD,

MELTED TIN,

MELTED PARAFFINE WAX,

BOILING LINSEED OIL,

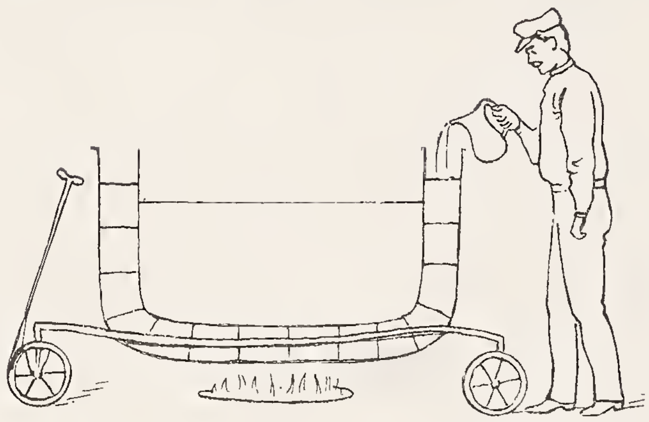
until the liquified metal or boiling oil reaches F.; when this is done, the inside kettle is then surrounded from top to bottom by a material which receives directly the entire heat from the furnace, and transmits it IN-DIRECTLY to the Varnish Gum, the Prepared Oil or the Varnish, or whatever preparation may be placed in the inside kettle.



The kettle should be mounted on truck of four wheels, resting on a double rail, which will enable the operator to move it to and from the fire place as quick as necessary.

#60 . MELTED METAL HEATING PROCESS BY THE USE OF THE DOUBLE KETTLE

Our double kettle having been constructed as per description already given, and metallic lead in fusion poured between the outside and the inside kettle so as to fill the space up to F, if



we carry the double kettle over the fire place where there is already an incandescent fire of coke, the melted lead will remain in fusion as long as the heat developed by the furnace and transmitted directly to the bottom of the outside iron kettle will be high enough to reach 629 deg. F., which is the melting point of Metallic Lead.

Under these conditions, we insure all around the surface of the inside kettle, through the contact of melted lead, an even temperature absolutely uniform, of 629 deg. F.; and this temperature is exactly the same at the upper part of the kettle as the lower part.

No matter what may be the temperature developed by the fire underneath, this temperature will never reach the inside kettle, but will be confined to melting the lead at 629 deg. F.

This temperature of 629 deg. F. will be amply sufficient for making any kind of Oil or Varnish, and all danger of over-heating the oil or burning the gum will be eliminated from the fact that the excessive temperature of the fire place, even should it reach 1200 deg. F., will be diffused through the melted lead and reduced by it to 629 deg. F., the only temperature which may attain the inside kettle.

#65. If instead of using melted lead, we adopt melted tin as a source of heat between the two kettles, the melting point of tin being 442 deg. F., the temperature developed all around the inside kettle will be then 187 deg. less than that developed by MELTED LEAD.

MELTED TIN should be used in place of MELTED LEAD in cases when Varnishes exceedingly light in color are to be made at the lowest possible temperature; and this process is far better in every respect than the STEAM JACKETED KETTLE PROCESS or the SUPERHEATED STEAM PROCESS, which is itself an improvement on the single bottom copper kettle heated directly by an incandescent fire.

In the STEAM JACKETED KETTLE PROCESS, the heat developed depends mostly upon the STEAM PRESSURE and therefore is very difficult to regulate uniformly; while the heat developed indirectly by either MELTED LEAD or MELTED TIN, remains invariably at 629 deg. F. or 442 deg. F. respectively, an advantage which never could be obtained through the processes used heretofore.

ABOUT MELTED PARAFFINE WAX AND OVER-HEATED LINSEED OIL

as a source of indirect heat

FOR PREPARING OILS AND MAKING VARNISHES.

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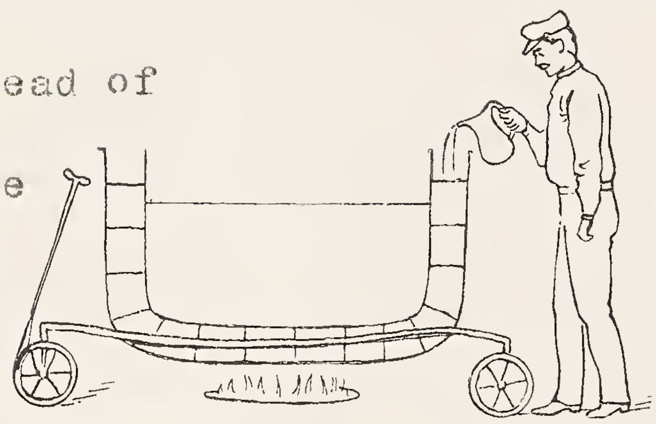
Instead of using a metal in fusion as a source of heat, we could use PARAFFINE WAX previously melted and then poured in the space between



the two kettles exactly as it has been done with MELTED LEAD and MELTED TIN.

THE MELTING POINT OF PARAFFINE WAX is 140 deg. F., which temperature will not be sufficient for use as a source of heat in Varnish making; but if after placing the melted Paraffine Wax so as to fill the space between the two kettles we increase the heat until the paraffine wax reaches its BOILING POINT, we will thus produce a source of heat of 666 deg. F., absolutely uniform from the upper part to the lower part of the kettle.

Should we fill the space between the two kettles with raw Linseed Oil instead of melted lead, melted tin or paraffine wax, and then carry our double kettle over the fire place, the Linseed Oil which is between the two kettles may be over-heated, it may "BREAK", it may reach the FLASHING POINT, but it will protect the Varnish or the oil inside of the double kettle from all danger of BURNING or OVER HEATING.

V A R N I S H   T H E R M O M E T E R S .

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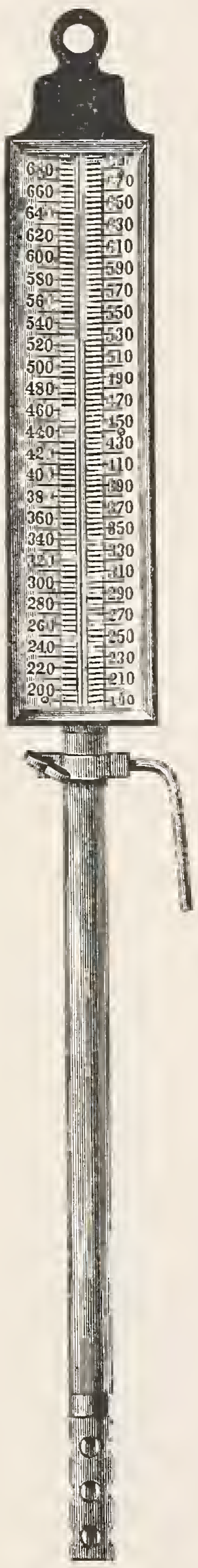
#79. According to precepts from Varnish makers of the old school, the operator must have such experience of the peculiar characteristics or of the general aspect of a Varnish at any stage of the operation during the process of MELTING, COOKING or OXIDIZING, that the help of a Varnish thermometer is for him unnecessary.

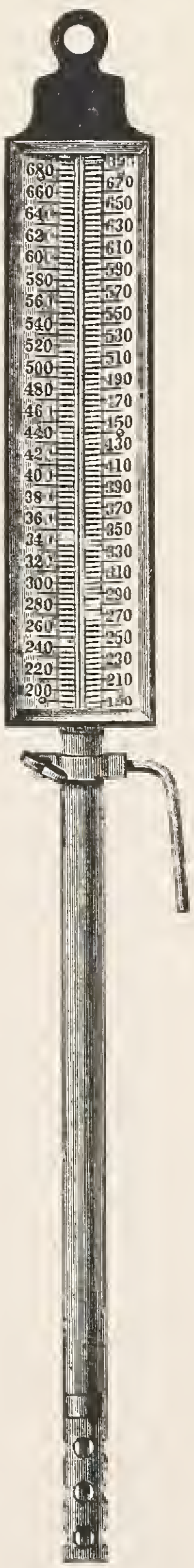


#80. This theory of making Varnishes, aside from the life-time experience which it requires before an operator can master a subject of secondary importance, such as carrying on or removing from the fire place at the proper moment a heavy Varnish kettle, presents many other objections.

No matter how many years a SMELTER or a Varnish operator may have spent in the melting room constantly watching the effects of temperature while a "BATCH" of Varnish or Prepared Oil is on fire in a single bottom copper kettle, it is an utter impossibility for him to impart the same amount of CALORIC twice exactly to the same extent, as this amount of caloric depends entirely on the intensity of the fire underneath; which fire, as it has been already mentio-

strated, is always beyond his control.

#90. A very simple experiment could convince any Varnish maker of the old school believing in the preparation of oils or Varnishes without the use of a thermometer, that no matter how competent he may be, all his calculations are misleading; and that



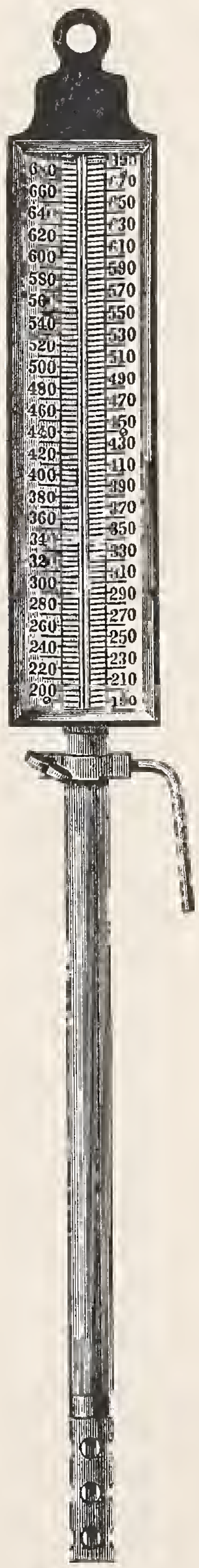
there IS NOT SUCH A THING AS MAKING TWO BATCHES OF VARNISH FROM THE VERY SAME FORMULA ABSOLUTELY ALIKE.

For instance, let him make with the greatest care and all the skill he may possess, and from the very same formula, the same class of gum, the same prepared oil, two "BATCHES" of MEDIUM RUBBING BODY, ZANZIBAR or KAURI VARNISH; and after the last operation of THINNING DOWN has been made either with TURPENTINE or BENZINE, let him take a sample directly from the kettle and before sending the Varnish through the rotary pump to its respective tank.

Now if we use an oleometer or a very sensitive hydrometer, and put it in a graduate containing already that sample of Varnish from the kettle, and note exactly the specific gravity indicated by the instrument, we will see that the specific gravity of the second sample taken from the second "BATCH" made according to the very same formula, varies from 9,500

to 9,350, or a difference of no less than 50 sometimes in the specific gravity of two Varnishes which were intended to be made precisely alike.

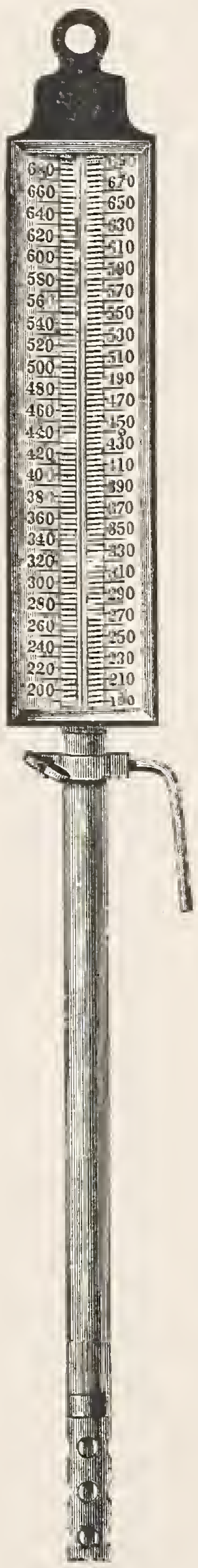
The same experiment can be made with almost any kind of Varnish, WITH OR WITHOUT THE USE OF A THERMOMETER, using as a receptacle the ordinary single bottom Varnish kettle; and a discrepancy often as large as the one above will be noticed, in all cases due to the very same cause, a difference in the amount of CALORIC absorbed by a "BATCH" of Varnish from the moment of MELTING to THINNING DOWN.



If, instead of considering two samples of Varnish taken directly from the kettle before cooling down, we take the two samples eight days after the two "BATCHES" of Varnish have been made, and then compare these two samples as to BODY, FLUIDITY or CONSISTENCY through a viscosimeter, we will find a great difference in the body of these 2 samples; and in some instances the difference is such that the operator could hardly believe that this is the result of twenty years' experience and skill.

The Varnish thermometer will certainly not remove the causes which produce a dark color in a Varnish or a prepared oil made by a skilled operator through the use of an ordinary single bottom copper kettle directly heated,

neither will it enable a Varnish maker to produce two "BATCHES" of the same varnish absolutely alike; that is, showing exactly the same specific gravity; but it will surely in the hands of an intelligent operator lessen the risks of over-heating or not heating enough. In other words, a Varnish thermometer may be considered as the best guide in Varnish making through direct heat.



#100. The usefulness of a GOOD VARNISH THERMOMETER is no longer a questionable hypothesis; as it was only three years ago when nothing definite had been found as to the EXACT MELTING POINT, the BOILING, the BURNING and the FLASHING POINT of all sorts of Varnish gums and resins.

Today thanks to the TABLES FOR GUM SMELTERS comprising the results of all experiments made up to date with a view to ascertain and determine accurately the MELTING, the BOILING, the BURNING and the FLASHING POINT of all sorts of Varnish gums and Resins, the REACTIONS and INCOMPATIBILITIES of all sorts of copal gums, resins and hard gums of every description melted together in the copper kettle; an ACCURATE VARNISH THERMOMETER has become an absolute necessity of the times; and it may be said that the greatest step forward for the past 50 years in PRACTICAL VARNISH MAKING was accomplished the day when the EXACT POINT OF FUSION of all rosins was accurately determined.

HOW VARNISH THERMOMETERS OUGHT TO BE USED.

#110. Owing to the capital importance of questions of temperature

in the manufacture of prepared oils and fine Varnishes, it is absolutely necessary to get an instrument not easily affected in its accuracy by sudden or rapid changes of temperature. The proper selection of a Varnish thermometer is not a question of secondary importance, as on the accuracy of this instrument depends to a great extent the uniformity of the results.

Varnish thermometers are made today at an exceedingly low price; but it would be a wrong policy for a Varnish maker to consider economy in a matter of this kind. A good Varnish thermometer must be not only sensitive but it must operate perfectly and always uniformly from 212 to 680 deg. F.

In making a "BATCH" of PREPARED OIL, JAPAN or DRYER, in making Varnish Oils in a kettle such as the one above, the average temperature can be determined only at 6 inches above the bottom of the kettle; should a Varnish thermometer be allowed to rest upon

93
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751
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846
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1287---
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2390
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2446---
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126
2660
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2960
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3290---
276
3566
12
3578

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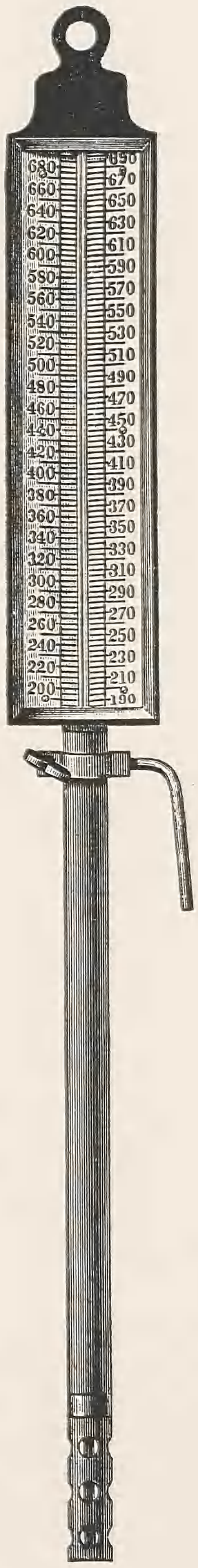
97
3675
129
3804
256
4060
317
4377
13
4390

the bottom of a Varnish copper kettle, the temperature to which it would be at once submitted would cause a separation of the MERCURY COLUMN, as no matter how carefully a Varnish thermometer has been constructed, it cannot stand instantly the direct action of an incandescent fire and run at once from 50 or 75 deg. F., which represents the ordinary temperature, to 680 deg. F. without being rendered inaccurate for the next operation.

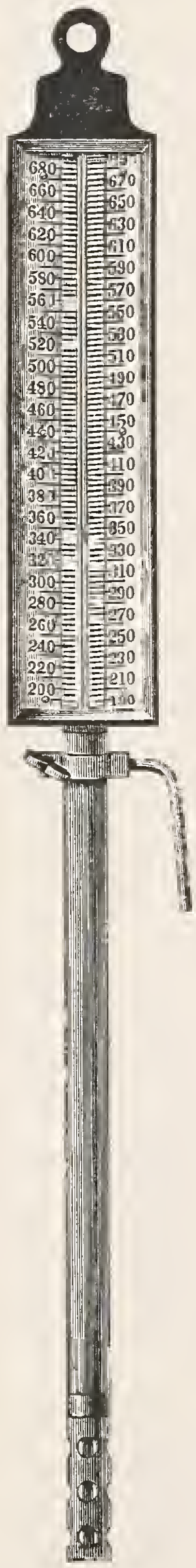


#120. Amongst the causes which contribute mostly to the inaccuracy of a good Varnish thermometer in a very short time after being used, must be mentioned first the SUDDEN JUMPING" of the mercury column, which is inevitable when through carelessness of ignorance a Varnish operator allows his thermometer to stand vertically on the bottom of the copper kettle instead of gradually and carefully introducing it into the mass of the oil or Varnish so as to rest suspended by the hook at 6 inches at least from the bottom of the kettle.

Varnish thermometers of very good make can be rendered inaccurate and totally unfit for further use after one single operation in the hands of a careless or inexperienced operator.

In Varnish making, as in any other branch of industry or

manufacture, if QUICK WORKING is desirable it never should be sacrificed to good results. Rough handling of Varnish thermometers is another cause which contributes to their getting out of order very rapidly, no matter how substantially they may have been constructed.



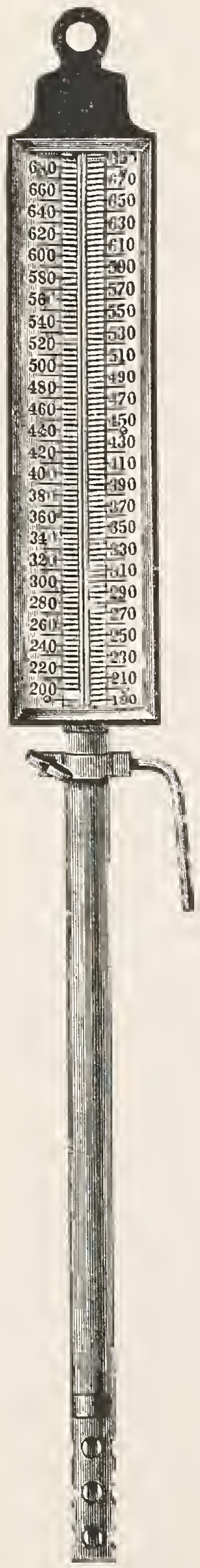
As it may very often happen that the temperature of a "BATCH" must be at once determined, rough handling of a Varnish thermometer cannot be always avoided; and for this reason in selecting this instrument for use in Varnish making, special attention must be paid to the protection afforded to the bottom of the column of mercury by a rational construction.

#130. The BULB, which is the mercury receptacle, must be carefully protected by a frame of metal built so as to prevent it from coming in contact with the prepared oil, the Varnish or the Japan in which the thermometer is to be immersed.

A Varnish thermometer properly constructed must be easy cleaning, as the accumulation of either fatty or resinous substances having sometimes an acid reaction would soon destroy the metal or impair the sensitiveness by the obstruction of the frame which surrounds the BULB, or mercury receptacle.

HOW VARNISH THERMOMETERS SHOULD BE KEPT AFTER USING.

#140. After using a Varnish thermometer, especial care should always be taken by the operator not to allow his instrument to stand on the floor for the very same reason which has been indicated by the necessity of avoiding sudden or too rapid changes of temperature.



After removing a Varnish thermometer from a preparation heated above 650 deg. F., should the thermometer be allowed to rest on a damp floor, the mercury column would so rapidly descend into the BULB that a separation of the mercury may result.

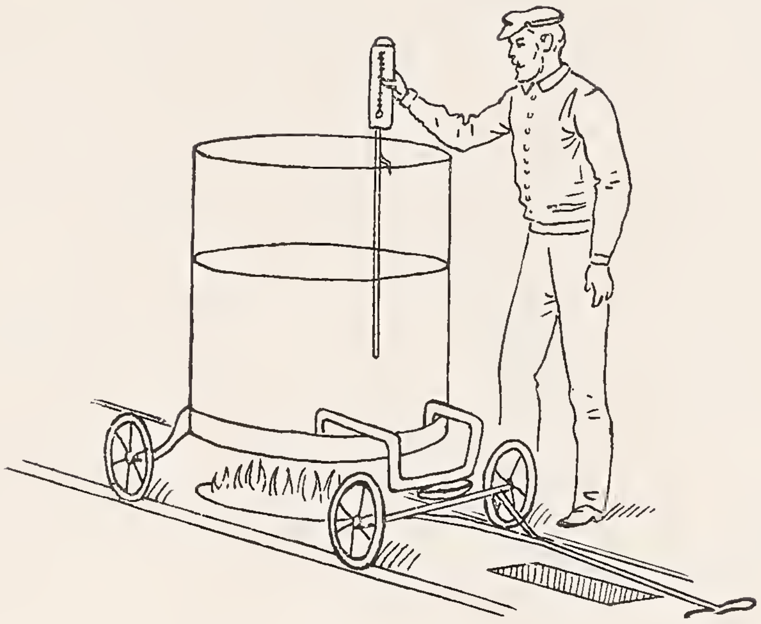
A special place should be had in the melting room for the Varnish thermometers, so as to keep them when not in use always suspended by the hook from three to four inches from the wall.

Cold water should never be used for cleaning a Varnish thermometer; and when an Alkaline solution is used, either Caustic Soda or Aqua Ammonia, they should be previously heated to 175 deg. F., a little more or less.

Turpentine or Benzine should be used in preference to anything else for cleaning Varnish thermometers.

N A T U R A L   G A S

As a source of heat in Varnish making.



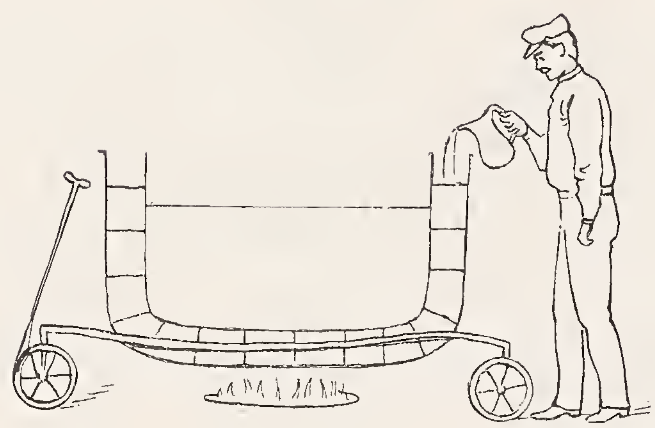
#150. In a single bottom copper kettle such as commonly used in Varnish factories, a great deal of care should be exercised by the operator so as to carry his kettle on the fire place only when the coke fire has been perfectly lighted and has become incandescent without the production of flames.

A coke which produces smoke or flame in burning, should be rejected, as it prevents uniform heating.

For this reason, NATURAL GAS is unfit as a combustible, in spite of its cheapness.

By the use of the double kettle, it becomes possible to use not only NATURAL GAS but almost any kind of combustible, as the objection against the heating not being uniform is entirely removed for the reasons already explained at length.

#160. With a double kettle (as per cut) instead of the ordinary fire place perforated coils may conduct the NATURAL GAS under the bottom of the kettle, and this NATURAL GAS may give instantly, by being simply lighted by a match, a very strong heat



fully equal (as to the temperature that it can develop) to any fire made of coke; with the immense advantage of being regulated at will through the use of a valve.

By the use of NATURAL GAS and the double copper kettle in Varnish making, the kettle has never to be removed from the fire place in case of too much heat being developed; all that is to be done is to shut off the gas by turning the valve until the preparation has been cooled down as desired.

In the NATURAL GAS REGIONS, some varnish makers have already adopted this sort of combustible in place of coke; and it costs only the small amount of $8. per year to keep a fire-place constantly lighted or ready to be lighted at any time.

As to the cost of the organization for heating through NATURAL GAS, it is about the same as the ordinary furnace.

H I G H   P R E S S U R E   S T E A M

as a source of heat in Varnish making.

"170. Were it not for the fact that it is extremely difficult to get a temperature high enough and sufficiently uniform to conduct without interruption in a comparatively short time a "BATCH" of prepared oil or Varnish, the use of HIGH PRESSURE STEAM would be very valuable as a source of heat for the simple reason that it would preclude all possibilities of burning the gums or overheating the oil.

But as the temperature produced by the steam in a jacketed kettle is depending constantly upon the pressure, the heat for this reason cannot be increased at once when necessary, neither can it be reduced when found too high.

There are, however, in Varnish making, many applications for a steam jacketed kettle; but these applications are confined to melting soft resins, or to a previous bodying of raw Linseed Oil, or previous heating of a Prepared Oil.

COMPARISON OF THE TWO METHODS FOR HEATING DIRECTLY AND INDIRECTLY.

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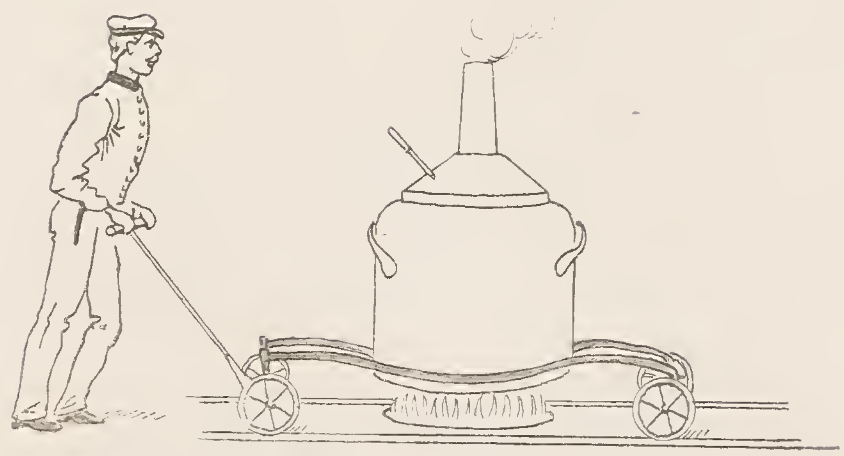
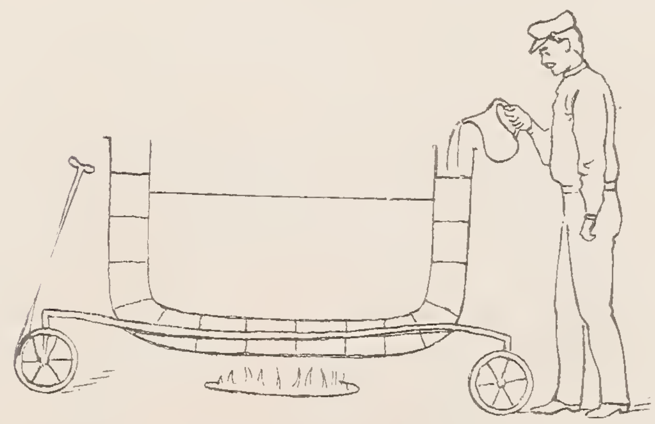
#180. The two methods are fully and plainly illustrated by the following cuts, which show comparatively the distribution of heat generated by the furnace.

USUAL METHOD OF DIRECT FIRE AND SINGLE BOTTOM VARNISH KETTLE.



Constant danger of Burning the Oil.

IMPROVED METHOD OF INDIRECT FIRE AND DOUBLE BOTTOM VARNISH KETTLE.



No possible danger of Burning the Oil.

Part No. II

(See Index on the next page.)

Subject Treated.

QUESTIONS OF KETTLES AND FACTORY APPLIANCES.

Part No. II.

QUESTIONS OF KETTLES.

Their influence upon the results.

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QUESTIONS OF KETTLES.

Their influence upon the results.

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#200. In the manufacture of Varnishes, the treatment of oils, the oxidizing of gums or resins, complex chemical reactions often very powerful take place inside of the Varnish kettle and under the action of a temperature of several hundred degrees. It is then a question of the greatest importance to know exactly what influence the metal of the kettle may have upon the chemical reaction; to know also if this chemical reaction will not be counteracted by the metal, or if the metal of the kettle will not have a darkering effect upon the oil, the rosin or the gums.

Whst is the best metal that a Varnish kettle should be made of, so as to produce a Varnish or an oil as light in color as possible?

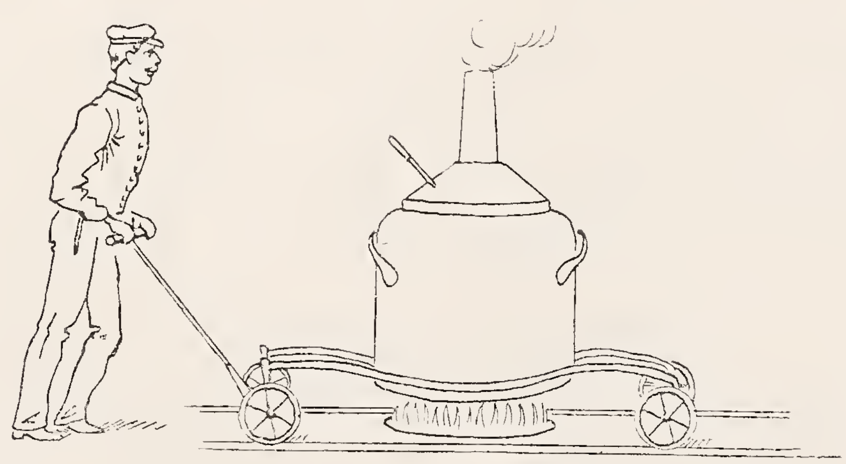
This question is certainly not a new one to experienced Varnish makers; still, it is not so easy as it first appears to answer, and progressive manufacturers lose no opportunity to experiment and try new metals, alloys or combinations of metals that their experience may suggest as being better for making Varnishes than the iron or the copper kettle adopted generally.

ABOUT COPPER AS A METAL FOR VARNISH KETTLES.

The metal most generally adopted for Varnish kettles is "Copper", and the shape of the kettle as per cut here below.

Copper stands a high temperature; its melting point is 27 deg. of the pyrometer of Wedgewood, corresponding to 700 deg. cent. Its density varies with its degree of purity, and can be increased by hammering. When reduced in sheets thin enough to be transparent, the sun rays passing through it are colored in a magnificent green, like Paris Green.

Copper is a metal offering a considerable power of resistance to tension or weight, and this can be easily judged from the fact that a copper wire of only 0, m m 02 of diameter will stand



without "Breaking" a tension the limit of which is a weight of 137 kilograms. Consequently, in regard to tenacity, it ranks second to iron and takes place between this metal and platinum.

In Varnish making, copper metal is largely utilized for

kettles owing to its lack of affinity for dry oxygen at the ordinary temperature. There is, however, a serious objec i on to this metal. If copper has no affinity for dry oxygen at the ordinary temperature, it is not so under the action of fire When strongly heated, in contact with the air it becomes covered by a reddish pellicle or film, which is nothing but Protoxide of Copper. This Protoxide soon changes of nature, absorbs a new amount of oxygen and becomes Black Binoxide of Copper. Dampness acts on copper rapidly, and produces not verdigris as is generally supposed, but Hydrated Carbonate of Copper.

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ABOUT THE ACTION OF OXIDIZING ACIDS UPON A VARNISH KETTLE MADE OF COPPER.

#209. In producing an intense bodying and oxidizing of Linseed Oil or resins, some Varnish makers are using Nitric Acid as an oxidizing agent. This o peration should not be done in a copper kettle, as the Nitric Acid will at once act upon this metal and produce a black precipitate of Nitrate of copper.

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ACTION OF OILS, ALKALIES AND FATTY SUBSTANCES ON COPPER KETTLES.

#210. Organic acids and alkalies produce a rapid oxidation of metal copper. If we paint a copper surface with either oil or grease, we can soon notice that the metal is strongly oxidized.

Such is the case when common salt or ammonia is left in solution in a copper vessel; the solution absorbs rapidly the Oxide of Copper that is produced, and the liquor assumes a blue color.

Oils left for some time in a copper vessel or can, assume a bluish or a greenish color.

For the reasons above explained, copper as a metal for kettles is far from being perfect in Varnish making.

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VARIOUS SHAPES OF VARNISH COPPER KETTLES.

#215. Various copper kettles are made in various shapes and sizes, according to the uses for which they are intended and the amount of oil or Varnish to be treated in one "BATCH".

ENGLISH KETTLES:

#220. The oldest recipient for Varnish making was the "English Varnish Pot" with or without cover, the shape of which is conic and is the same in the small English copper kettles of today.

This kettle is generally made so as to hold only 30 to 50 gallons.

Several Varnish makers of the old school in England are producing

with it faultless Varnishes exceedingly durable, and would not adopt another shape of kettle or a larger kettle for fear of being unable to get identical results. They seem to believe that Varnishes ought to be made only in small quantities at a time, and consider a large "BATCH" as being unmanageable on fire, no matter what precautions may be taken to insure proper results.

GERMAN COPPER KETTLES:

#225. The German copper kettle is larger than the English kettle, and has a much thicker and wider bottom; the shape is also conic. Good Varnishes are made in these kettles by German operators, but not as good as the English, especially "Wearing Body "Varnishes".

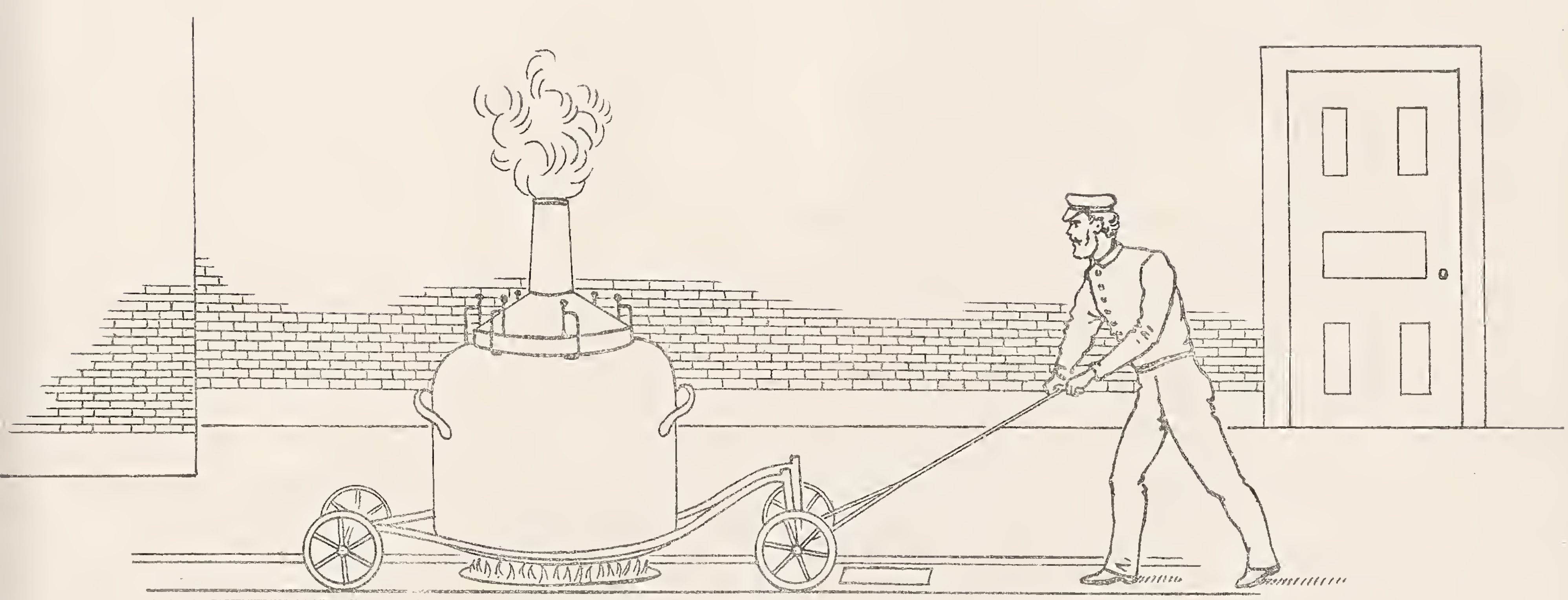
Large kettles are also used in Germany for making prepared oils of all sorts; but for the treatment of gums in the manufacture of finest Varnishes, German operators, same as the English, seem to believe in small "BATCHES" for getting the finest results. Several brands of German common furniture Varnishes made in these kettles can hardly be duplicated in this country for the same price.

FRENCH VARNISH KETTLES:

#230. The latest Varnish kettles adopted in Paris combine the lightness of the American kettle with the advantages of the double bottom Varnish kettle. For full particulars about the peculiar constructions, see in the previous chapter on Questions of Temperature, the paragraph entitled "THEORY OF THE MANUFACTURE OF VARNISHES ACCORDING TO PRECEPTS OF VARNISH MAKERS OF THE NEW SCHOOL

AMERICAN VARNISH COPPER KETTLES:

#235. American kettles are strongly built and much



easier to handle than the English or the German kettles.

A 200 gal. copper kettle, constructed as the one above, weighs from 315 to 320 lbs., including the cover.

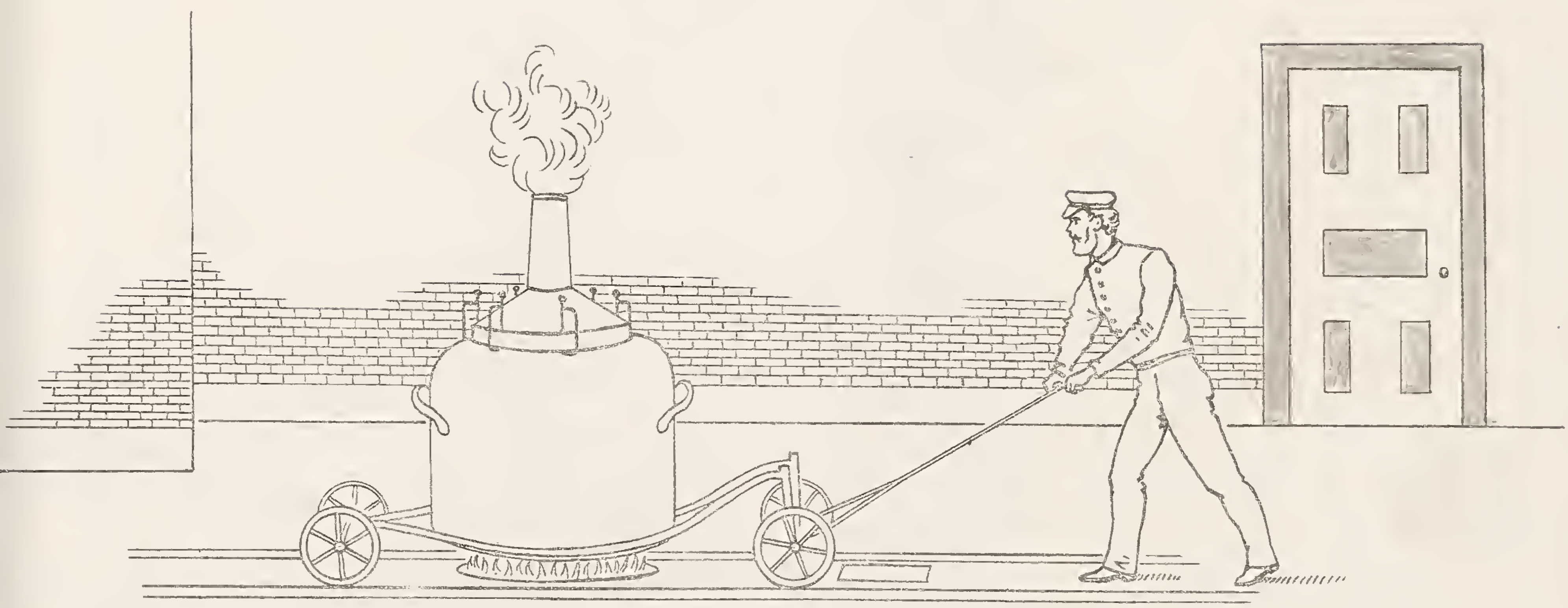
#240. As the price of copper metal is subject to frequent market fluctuations, the price of the kettles varies accordingly.

The price of a Varnish copper kettle is calculated by the weight, and an increase of the price per lb. of copper for labor.

For instance, figuring at 43 cts. per lb. for a 200 gal. copper kettle, this will cost the amount of $157.60.

The truck on which a 200 gal. copper kettle is mounted, is made of iron and has four wheels so disposed as to remove the kettle from the fire at any moment rapidly.

For a 200 gal. copper kettle, the cost of a truck is about $40.



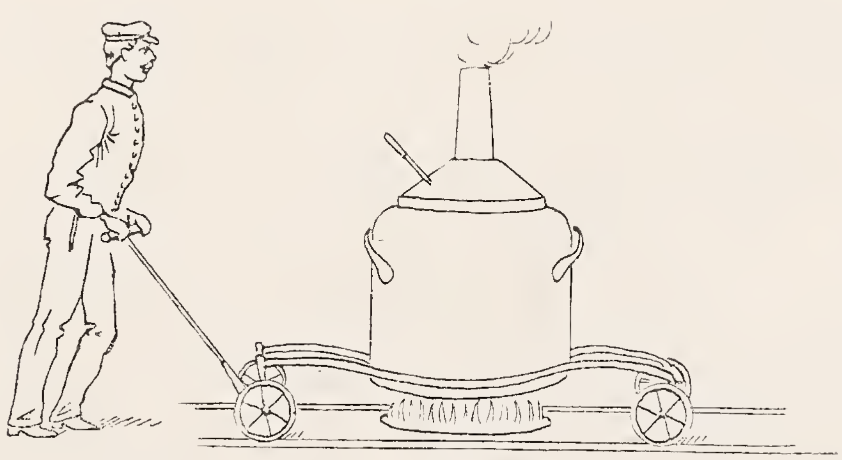
A 150 gal. Varnish copper kettle weighs from 290 to 300 lbs., including the cover. A kettle in constant use, constructed as above, lasts only 5 to 6 months, after which time the single bottom is generally burnt and must be changed.

IMPROVED GUTTER COPPER KETTLES:

#245. One of the latest improvements in Varnish copper kettles consists in a gutter around the kettle near the top, and in which is collected the condensed water of evaporation or resinous fumes from the melted gum as soon as they are produced.

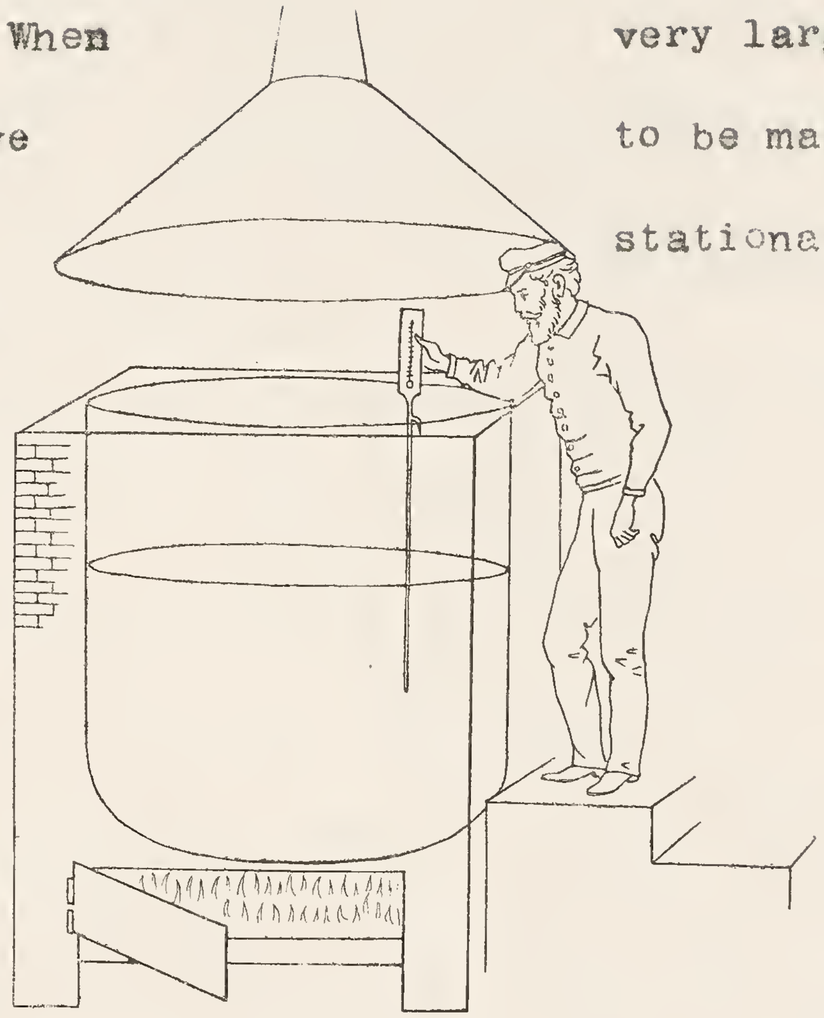
This water contains a good deal of resinous matters which are very inflammable. The gutter collects them and prevents them from running in the furnace.

Copper kettles originally made without gutters can be provided with one when necessary. The cost of placing a gutter around a new or an old copper kettle is figured at 2 cts. per lb. above the price of the worked metal.



Improved gutter copper kettles are constructed in New York and have met with great favor amongst Varnish makers not only from the United States but also from England, where they have been adopted in preference to the old style of English Varnish kettles, already described in this chapter.

STATIONARY KETTLES:



#250. When very large quantities of Prepared Oils have to be made at a time, ket- tles are put up stationary and built upon a larger furnace. The kettle is then surrounded by brickwork and a cooling cham- ber or heat ex- hauster is con- nected with it. The capacity of stationary ket- tles varies from 500 to 1000 gals. and is calculat- ed according to the daily pro- duction wanted.

As it requires from 7 to 8 hours to prepare an oil in- tended for use in Varnish making, the advantage of very large ket- tles lessons considerably the price of labor.

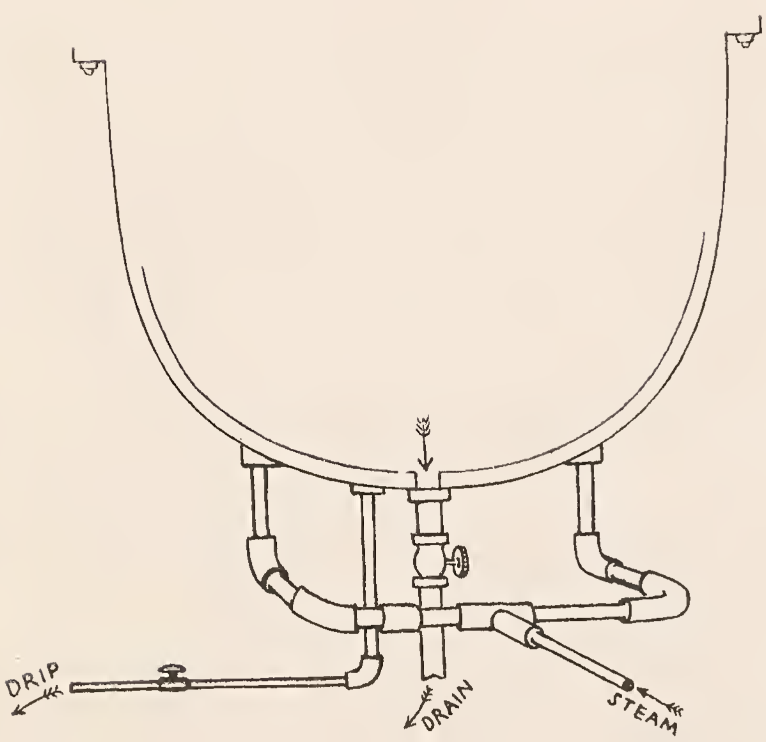
After pre- paring Varnish Oils in quantities of 1000 gals. at a time, and allowing them to settle over night so as to clarify, it is not necessary to send the oil through a rotary pump in a large oil tank, but simply put it in barrels directly, providing that the oil is cold enough to be shipped.

STEAM JACKETED KETTLES:

#255. Are necessary in the preparation of menstrums, rosin or shellac compounds, saponified vehicles and previous heating of an oil when a temperature not above 212 deg. F., the BOILING POINT OF WATER, is required.

In making Varnishes, the use of high pressure steam jacketed kettles is sometimes resorted to; but the temperature thus obtained is not high enough for the oxidizing, bodying and general treatment of oils and hard gums.

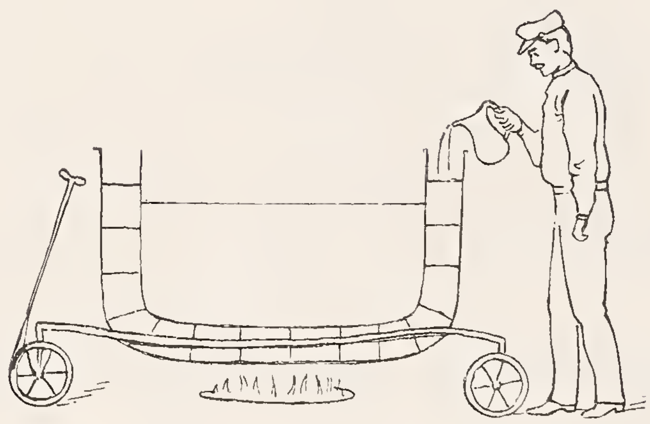
When a hard gum has to be melted, or a Varnish oil has to be heated at the lowest possible temperature, so as to avoid all danger of burning or overheating, as the temperature developed by the steam would not be high enough, it is then preferable to use the new style of double copper kettle, as per instructions given in Questions of Temperature.



By forcing steam into a kettle, such as the one above, the temperature may be somewhat kept to a higher point; but owing to the fact that the temperature depends on the steam pressure in this case, the uniformity of heat can hardly be regulated.

METAL BATH KETTLES:

#260. In making prepared oils, Varnish oils or Varnishes by the melted metal heating process, the kettle should be construct



ed on the same principle as a water bath; a recipient or an iron kettle into which a fused metal, such as lead or tin, is poured in a perfectly liquified state; and another kettle, this one made of copper, which is to be dipped into the melted metal; the preparation of Varnish being conducted inside of the copper kettle.

Through the use of a chain and a pulley suspended to a hook, the copper kettle is taken out of the metal bath when wanted, the weight of the melted gum or the oil in the copper kettle being sufficient to prevent it from floating over the surface of the melted metal.

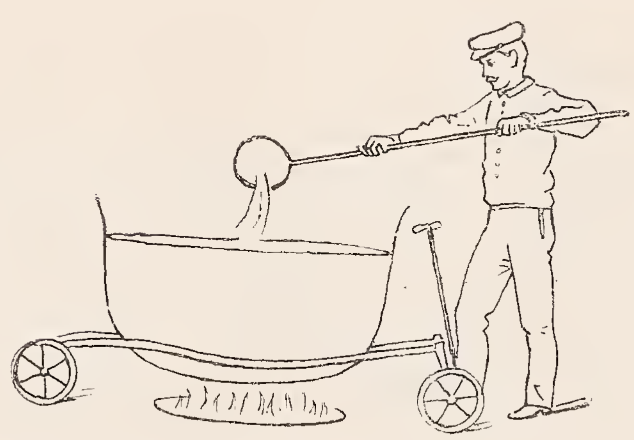
Instead of using a chain to raise the inside kettle and take it out of the metal bath, which is not only a very tedious but a dangerous operation, it is much more safely to use a double kettle as per above cut and at length described in the chapter on "Questions of Temperature".

IRON VARNISH KETTLES:

#205. In the manufacture of Japan dryers, oxidized rosin, black Varnishes, Baking Japans, the copper kettle is not used; instead, a large 500 gal. iron kettle of a shape as per cut, mounted on truck, is adopted in preference .

In the preparation of Varnish oils in large quantities, copper kettles are not absolutely necessary; iron kettles answer the purpose just as well, and are a great deal less expensive.

In the preparation of highly oxidized oils by the use of



a corrosive oxidizing agent, such as Nitric Acid, the copper kettle must be rejected as unfit for use for the reason that the Nitric Acid would at once attack the metal, producing a black precipitate of Nitrate of Copper.

Small iron kettles of a capacity of about 9 gals., built with a furnace underneath, will be found very useful in the melting room for a previous heating of a prepared oil which is to be added to a "BATCH" of melted gum for making Varnishes.

ALUMINUM KETTLES:

The necessity of Varnish kettles made from a metal not affecting the chemical reactions of an oxidizing compound, lead some Varnish makers of the new school to experiment on the peculiar properties of the new metal Aluminum.

The metallurgy of Aluminum is yet in its infancy; however, this metal is rapidly coming to the front and its use is every day larger; its applications are many, and as a metal for making Varnish kettles, no doubt that it will some day take the place of copper.

The advantages of using a Varnish kettle made of Aluminum instead of copper are numerous; in the first place, a 200 gal. Varnish kettle, if made of copper, weighs from 315 to 320 lbs., while an Aluminum kettle of the same capacity will weigh only 98 lbs.

Unlike copper metal, Aluminum is unaffected by damp air and not oxidized by heat; while the metal from which Varnish kettles are made today (Copper) is strongly oxidized by heat, and under the action of damp air soon covered by a heavy coating of Carbonate of Copper, soluble in Linseed Oil or other oils.

Energetic chemical reaction can take place in an Aluminum Varnish kettle without affecting the metal. In producing an intense bodying or oxidizing of oils or rosin by the use of Nitric Acid, Aluminum Varnish kettles remain unaffected, while kettles

made of iron or brass would be soon destroyed or corroded.

An oil kept in can made of Aluminum will never turn green

ABOUT SILVER AND PLATINUM CONSIDERED AS METALS FOR VARNISH KETTLES.

In their researches for a perfect metal for use in Varnish kettles, French and English chemist Varnish makers have made laboratory experiments on a small scale with recipients made of precious metals, such as silver and Platinum.

Silver does not combine with the oxygen of the air, even under the action of the highest temperature; unlike copper, it has no coloring effect on Linseed Oil, and stands the action of alkali better than aluminum, which produces an aluminate of Potash or Soda when put in contact with a boiling solution of Caustic Soda or Potash.

Aside from the question of price, which is a bar to its use in making Varnish kettles, there are other reasons which place silver as a metal second to Aluminum. Silver has a greater density than copper; it is over four times heavier than Aluminum. Furthermore, it turns black instantly under the action of Sulphhdric acid or sulphurous emanations, while Aluminum remains unaffected.

The properties peculiar to Platinum of being unalterable at the highest temperature and unaffected by the most powerful re-

agents, acids or chemicals has suggested its use for making Varnish kettles.

Laboratory experiments were made and demonstrated conclusively that a Varnish kettle made of Platinum would present advantages over the copper kettle; the very high price of this metal is not the only objection to its use. There are industrial applications for it: viz, in the distillation of Sulphuric Acid, where stills of over 150 lbs. weight are in daily operation.

But from the standpoint of the Varnish maker, what is a precious quality in this metal becomes an objection.

Platinum possesses the singular quality of producing the combination of oxygen and hydrogen.

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FACTORY APPLIANCES FOR MAKING VARNISHES.

#270. Aside from the large Varnish kettles, stationary and mounted on trucks, there are other appliances absolutely necessary for making Varnishes and that a Varnish maker is constantly using for carrying out the numerous operations.

EXPERIMENTAL KETTLES:

#275. A small kettle of about 20 to 25 gals. capacity mounted on truck will be found very useful when a certain Varnish will have to be made according to special instructions, or with a view to duplicate a sample. A kettle of this sort can be had without truck for $24. to $25.

OIL MEASURES:

For measuring exactly and rapidly at any moment a certain quantity of oil or other vehicle; for carrying gradually

the oil into the melted gum, for measuring Benzine, Turpentine or other fluids, a vessel as per cut will be found very useful.

A 5 gal. oil measure, 13 inch bottom, 11 inches high and 9 1/2 inches diameter at the top costs about:

10 gal. measure	- - - - - -	$15.00
5 " "	- - - - - -	10.00

They are graduated inside so as to render very easy any measurement from 1 to 10 gallons.

COPPER FUNNELS:

Copper funnels are also necessary so as to carry a certain amount of oil in the copper kettle without having to remove the cover; the funnel is inserted in a circular opening placed on one side of the cover near the place where the operator stands.

These funnels are made generally so as to hold from 3 to 5 gallons of oil.

DIPPERS:

Dippers of one or two gallons capacity are used for

mixing the preparation when necessary for ascertaining the proper moment when a next operation must take place.

STIRRING TOOLS:

#278. In order to conduct properly the various phases of the operation in making a "BATCH" of prepared oil or Varnish, the operator must be able at any moment to take small samples from the kettle and watch the degree of fluidity or oxidation while the cooking is going on.

A complete set of stirring tools is therefore an absolute requirement in Varnish making. These stirring tools are as necessary to the Varnish maker as a stirring glass rod or agitator is to the chemist in laboratory works.

They are made in many different shapes, which can be reduced to three original types:

1st - - - The Iron Stirrer.

2nd - - - The Paddle.

3rd - - - The Whip.

IRON STIRRERS:

#280. Are simply rods of 4 to 5 feet long, provided with wood

handle, four of them as per cut for a complete set; the first stirrer is simply an iron rod; the second has a little spatula at the end; in Nos. 3 and 4, the spatula is larger. The object of this spatula is to prevent the gum from sticking to the bottom of the kettle when melting, and turn dark or burn under the action of the furnace fire.

PADDLES:

#282. Are made of about the same shape as the spatula stirrer, the end, or paddle, being much wider.

The paddle is used like the iron stirrer, through the cover of the kettle. It is used also to keep down a varnish compound or preparation which has a tendency to rise rapidly in the kettle; by simply applying it flat on the surface of the froth, this is kept from running over without having to remove the kettle from fire.

THE WHIP:

#285. Is mostly needed for subduing the froth produced by the chemicals in the Varnish kettle; this froth is of different degrees of intensity, and varies in color according to the various stages of the operation. The Varnish maker must be able to tell by the color, the thickness or the intensity of the froth in the varnish kettle, how much longer the action of fire is necessary before taking the preparation to the thinning room.

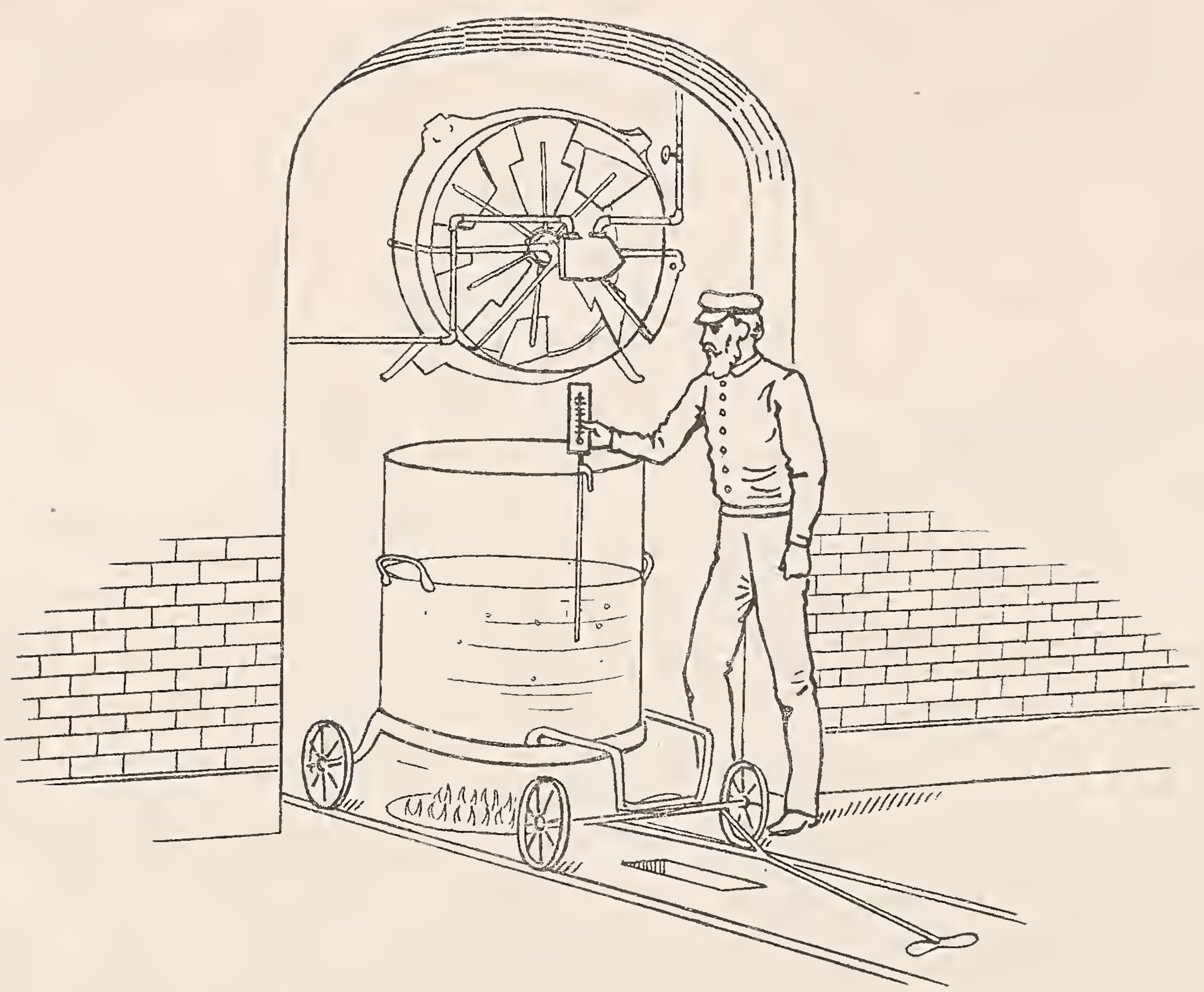
AUTOMATIC WHIP:

As there is sometimes, mostly in making Japan Gold Size and Brown Japans, a considerable amount of froth produced, the operator has a great deal to do to prevent the preparation from running over; the whip has to be used rapidly and constantly for half an hour. Automatic whips working like an egg beater will be found very useful in this case.

THERMOMETERS: At least 2 always at hand, graduated to 610 deg. F.

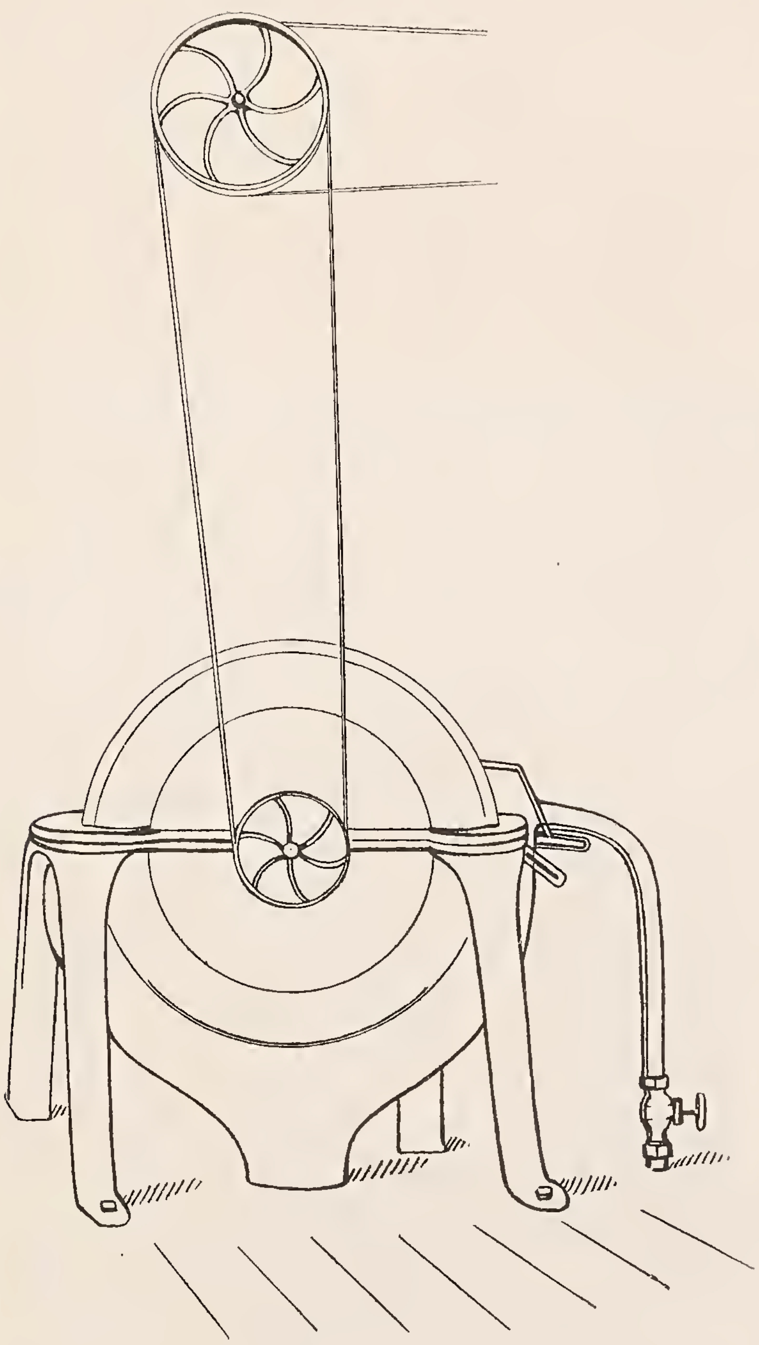
USE OF HEAT EXHAUSTERS TO PREVENT THE OVER-HEATING OF AN OIL OR VARNISH.

¶286. The heat exhauster is nothing but a fan or ordinary ventilating apparatus, which produces a constant and powerful current of air. It should be placed inside of the chimney and just above the Varnish kettle. As it can be easily seen, the exhausting fan has not only a cooling effect, but the extraordinary amount of oxygen which thus comes in contact with the surface of the oil or the varnish kettle, helps the oxidation and therefore intensifies the bodying. When when there is a tall chimney giving a powerful draught, the beneficial effect of oxidizing fans is evident. It insures the uniformity of the draught in days of contrary winds.



SAFEST MOTOR FOR VARNISH FACTORIES:

"290. There is not generally any power or shafting connection in the melting room of Varnish factories; and on account of the very inflammable materials used frequently in large quantities, such as Benzine, Turpentine, the greatest precautions have to be constantly taken so as to avoid the danger of explosion or fire. The simplest power motor, and at the same time the safest, is the



water motor constructed as per cut.

With this motor, fire is unnecessary, as there is no necessity for steam being produced; and all that is wanted is a one inch flow of common water running from an iron or a lead pipe to which the motor is simply connected.

The power given thus varies of course, with the pressure to a certain extent; but as much as 8 to 10 horses can be obtained.

It is needless to say that in a varnish factory, a water motor constitutes a very valuable adjunct, far superior to the ordinary steam engine. From it there is no dust produced, and no necessity for a boiler.

#295. ELEMENTS OF SUCCESS IN THE MANUFACTURE OF VARNISHES.

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1st. A perfect understanding of the process for which a Varnish is intended.

2nd. The technical knowledge of the buyer for the house.

3rd. The uniform standard of all the ingredients used.

4th. Means of thorough investigation, chemically, technically and physically.

5th. The simplest methods of heating, melting and cooking.

6th. Approved formulas.

7th. A thorough system in every department of a varnish factory.

Such are nowadays some of the numerous requirements for success that very seldom the same concern can combine.

In the manufacture of Varnishes, there is an infinity of details upon which the final success depends, that have been ascertained through endless experiments by experts, and therefore can be strictly followed. They are in reality the "Trade Secrets" of the Varnish manufacturer; these secrets are not owned by anyone in particular, and liable, therefore, neither to be sold nor betrayed.

PART No. III

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF VARNISH GUMS.

Part No. III.

QUESTIONS ON VARNISH GUMS.

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ABOUT THE PRACTICAL TEST, USES, APPLICATIONS, PECULIAR CHARACTERISTICS AND ORIGIN O F VARNISH GUMS AND ROSINS.

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#300. Applied chemistry has so very little to say regarding the nature and best method of selecting a Varnish gum, that the practical Varnish maker, for want of better means of investigation, has found himself compelled to make a special study of the peculiar characteristics of each gum.

Upon these peculiar characteristics are based some "rules of thumb" tests (generally organoleptic tests) which combine with simplicity and accuracy the advantage of entailing no loss of time and necessitating no special apparatus.

In ascertaining the value of a gum or resin submitted to him, the Varnish maker who is already acquainted with some peculiar features of this gum or resin physically, will utilize them as his best means of recognition, and therefore will at once look for these characteristics, which are the most familiar to him. He will first consider:

THE ASPECT OF THE VARNISH GUM OR RESIN GUM:

#302. Which tells at a glance all about the COLOR, the TRANS-

PARENCY and a great deal about the PURITY and FREEDOM FROM EXTRANEOUS SUBSTANCES. But if a great deal about the value of a gum can be judged from its nice appearance or its transparency, only but very little can be ascertained without further investigation as to its real nature, texture and behavior in the Varnish kettle, when submitted to the action of heat.

ABOUT THE FRACTURE OF A VARNISH GUM:

#305. It is a fact well known that the fracture of a lump of Kauri differs from the fracture of a lump of Zanzibar Gum; both are smooth fractures, but the former is rather dull while the latter is brilliant. Consequently, from the way a lump of gum or resin will break, something can be known which is peculiar to that gum or resin.

If further investigation is necessary, then the Varnish maker will consider:

THE SMELL OF THE VARNISH GUM:

#306. Some gums being entirely odorless; others have an aromatic odor very characteristic.

The next step to take in case of failure to ascertain the nature of the gum is to break a little lump, about the size of a pea, then place it in the mouth between the teeth.

ABOUT THE TASTE OF A VARNISH GUM:

#508. In placing a small lump of Varnish gum in the mouth, between the teeth, it will become possible to ascertain three characteristics of that gum:

1st. ITS BEHAVIOR AT A CERTAIN TEMPERATURE.

2nd. ITS HARDNESS.

3rd. ITS TASTE, WHICH IS OFTEN AROMATIC, OFTEN BALSAMIC.

#510. The heat of the mouth is sufficient to soften ANIME COPAL, while it has no effect whatever on ZANZIBAR COPAL, two Varnish gums which look so much the same that the most competent adepts are often unable to distinguish them.

Furthermore, ANIME, like MASTIC, COERULEUM, RUBBER and AIMADINA GUM becomes so soft in the mouth that it cannot be ground to powder between the teeth; while a lump of the same size of either NORTH COAST, ANGOLA or ZANZIBAR GUM will lose nothing of its original hardness, and a sublime pressure will break it to pieces or reduce it to powder between the teeth.

This very simple test affords an accurate means of recognition as to the nature of "hard" and "soft" gums; also as to the solubility and insolubility of a gum in water.

ABOUT THE HEAT OF THE HAND IN TESTING VARNISH GUMS:

#515. The heat of the hand is sufficient to detect the presence of colophony and common rosin, as it renders them tacky and adhesive. The temperature of the hand is more than sufficient for testing Asphaltum as to its freedom from mineral pitch and tar pitch. The two latter are sticky to the hand; the former is not.

BEHAVIOR OF A LUMP OF VARNISH GUM ON INCANDESCENT COAL.

#518. When a piece of Varnish gum is put on incandescent coal, it burns, producing a fuliginous flame and a dusky smoke of a penetrating odor.

There are not two different kinds of Varnish gums producing a flame of the same color in burning. The amount of ashes or residue of calcination is also a peculiar characteristic of each gum. It happens sometimes that a gum is entirely odorless at an ordinary temperature and even so in melting; while as soon as it burns, it develops a very peculiar odor. Olibanum, for instance, is a gum resin which becomes very soft, but has no taste or smell. Like rubber, it softens considerably through mingling, but it cannot be melted or liquified by heat. A temperature high enough ignites it; as soon as it burns it produces a very bright flame, and develops only at this temperature its Balsamic odor.

THRUSTING A RED HOT NEEDLE INTO A LUMP OF VARNISH GUM:

#520. This is another practical test for ascertaining comparatively the degree of hardness and approximately the melting point, also the brittleness, of two samples of Varnish gum; the needle will go deeper according to the hardness of the gum; and once put in it and allowed to cool, will enable to ascertain the adhesive power or cohesion of the gum.

BURNING A PIECE OR A LUMP OF GUM TO THE FLAME OF A LIGHTED MATCH.

#523. The heat developed by the flame of a lighted match is sufficient to generate all the volatil gases and inflammable matters of resinous nature which may be contained in a Varnish gum; it will also develop the aromatic odor of certain rosins generally noticeable only when the resin is burning. It is often possible to tell what is the nature of a Varnish gum by simply submitting it to the flame of a lighted match.

POTASH TEST OF SUCCINUM OR AMBER GUM:

#52 . Without going into chemical tests, there is a very curious and interesting experiment which can be made by anyone for ascertaining the genuineness of Amber Gum or Succinum. By simply moistening two pieces of Amber Gum with a solution of Potash, and

placing in contact together the two moistened surfaces, they become closely and intimately united as if they had been soldered.

TESTING A GUM CHEMICALLY FROM THE STANDPOINT OF ITS VALUE IN VARNISH MAKING.

#327. As it has been already said, there is but very little to learn, if anything, through chemical analysis about the value of a gum or resin considered as a material in Varnish making.

The only conclusive test that chemistry alone can enable to make in regard to the fitness of a certain gum for certain purposes in Varnish making, is the test as to ACIDITY.

And yet the acidity of a Varnish gum is not a serious objection to its use, as it can be removed to a great extent if not entirely, through the saponifying action of the chemical dryers which are generally metallic oxides, and therefore neutralizing agents.

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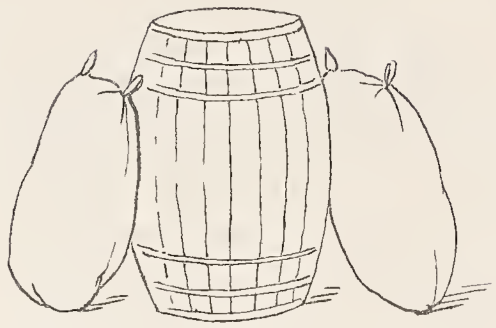
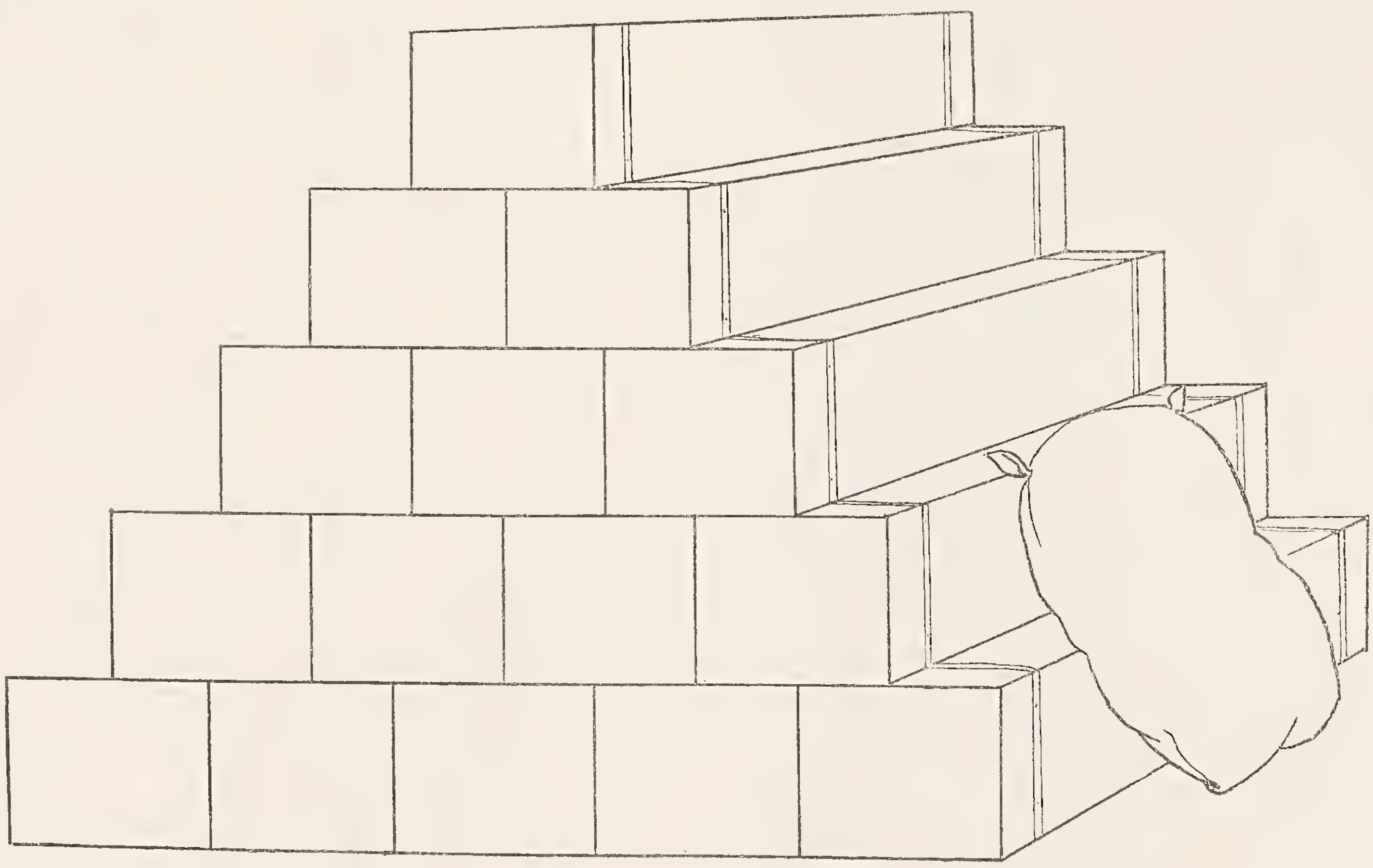
#330.

FACTORY STOCK OF VARNISH GUMS AND RESINS.





F A C T O R Y   S T O C K

O F

VARNISH GUMS, FOSSIL RESINS, NATURAL AND ARTIFICIAL PRODUCTS USED

I N   V A R N I S H   M A K I N G .

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ZANZIBAR GUM:

#333. Zanzibar Gum is one of the finest varieties of Copal. It is found in the market in various sorts, from the lightest to the deepest. The price is subject to fluctuations, but generally ranges from 15 cts. to 60 cts. per lb., according to grade.

The various grades are known commercially as ZANZIBAR PALE A, ZANZIBAR B, PALE SORTS, SIFTINGS, PICKINGS, etc., etc.

#335. Owing to its comparatively high price, the best grade of Zanzibar Gum is only used in the manufacture of Varnishes of the highest grade, and especially in:

	(Wearing Body Varnish.
Zanzibar Gum	(Quick Rubbing "
	(Rubbing "
is	(Polishing "
	(Extra Coach "
used for making	(Extra Furniture "
	(Liquid Filler.

Zanzibar Gum finds also many applications in the manufacture of Varnish specialties. (See formulas further on.) But in all cases where Zanzibar is used, the other ingredients are also

of the highest grade and selected so as to contribute to the finest possible results.

PECULIAR CHARACTERISTICS OF ZANZIBAR GUM:

#338. ZANZIBAR GUM is often called ANIME GUM. If we break a lump of this gum, we will notice that its fracture is smooth but not as brilliant as that of Kauri; it is rather dull; this gum belongs to the family of Copals; in fact, it is a very fine variety of Copal, and does not deserve the name of GUM ANIME often given to it improperly.

Gum Copal presents the peculiarity that it keeps its original hardness at a temperature which would soften ANIME GUM. A small lump of Anime Gum could be reduced to paste like chewing gum and without breaking; while Copal would not stand the same test, but would break into powder between the teeth.

ZANZIBAR COPAL is a light gum; its specific gravity varies according to its purity, and ranges between 1060 and 1070. Notwithstanding its light density, this gum requires quite a high temperature to enter into fusion; its melting point, like its density, varies with its degree of purity, and ranges from 438 deg. F. to 482 deg. F.

Zanzibar Gum is so hard that it could be ground to a fine powder through an ordinary chaser or an edge runner.

Zanzibar Gum gets its name from its country of origin, the Island of Zanzibar on the oriental coast of Africa. It is the product of extinct trees. This fossilized resin is dug out of the ground, covered with a powdery coat, often very hard and that can only be removed through scraping, brushing or washing.

After clearing, the gum is put up in cases and its price is regulated by its light color and transparency. The color varies from clear and very transparent yellow to Brownish red. It happens sometimes that pale Zanzibar gum of the higher grade, instead of being transparent, is cloudy and presents the aspect of a fresh fracture of Kauri Gum; this, however, affects in no way the whiteness of the Varnish made from it.

SIERRA LEONE COPAL:

#340. This is another variety of Copal from which splendid flowing and transparent Varnishes are made.

It is found in the market in two different grades or sorts; the first presents itself in the shape of pebbles of the size of a walnut, which seems to indicate that it is gathered from the bed of rivers. The second sort of Sierra Leone Copal is not a semi-fossil resin; it is collected from a tree; and while it is not so hard as the pebble Sierra Leone Copal, it is much whiter, elastic and transparent.

Sierra Leone Copal is remarkable by its freedom from

acid, which is an advantage of no small importance in flowing Varnishes. Its point of fusion is comparatively very low. The best grade of Sierra Leone melts in the Varnish kettle at a temperature of only 360 deg. F. Inferior grades present sometimes a much higher point of fusion, which may be in some instances; although very rarely, as high as 428 deg. F.

The composition of Sierra Leone Copal consists of three Resins, which have been separated chemically but imperfectly.

The first component resin is present to the extent of 60%, and is insoluble in alcohol and turpentine at the ordinary temperature; but after being heated to the melting point or 360 deg. F., it becomes soluble in Linseed Oil heated to the same temperature and can be diluted with the usual solvents.

The second component resin is present to the extent of 30%; this is entirely soluble in absolute alcohol and spirits of turpentine at the ordinary temperature.

The third resin or constituent of Sierra Leone presents a great deal of analogy with Kauri; it is the last part which melts and unquestionably the hardest component part of Sierre Leone.

In the Varnish kettle, Sierra Leone in its melted state mixes readily and works admirably with either ZANZIBAR, BENGUELA, ANGOLA and PREPARED ROSIN; it stands as much as 30% of W. W. Rosin without its original hardness being affected by the mixture to any noticeable extent.

PECULIAR CHARACTERISTICS OF SIERRA LEONE:

#342. Owing to its extremely pale color, its hardness, freedom from acid, and the facility with which it mixes with all sorts of Copal, except Manila, Sierra Leone is one of the most valuable Varnish Gums, as it enables the Varnish maker to produce a large variety of Varnishes to suit every possible requirements o the cabinet maker.

Sierra Leone is found in the market under the name of:

Sierra Leone Extra Pale A.

Sierra Leone Pale B.

Sierra Leone C.

Sierra Leone Pea Size.

The price of this gum is subject to fluctuations and varies from 40 cts. to 55 cts. per lb.

ANGOLA RESIN GUM:

#344. Is another variety of Copal Gums which has a great deal of analogy with Zanzibar; it is considered as having been originally produced by a tree and altered chemically by long exposure in the earth; it is, consequently, a semi-fossil resin. It is somewhat softer than Sierra Leone and Zanzibar; its color is a dark yellow; its general appearance differs from that of Zanzibar in the fact that it presents itself not in the shape of pebbles,

like Sierra Leone, nor in roundish lumps, like Zanzibar; but mostly consists of somewhat flattened pieces; its shape is so peculiar that after having been noticed once, it is always remembered.

Angola Copal works with almost any Copal in the Varnish kettle, and can be associated with Manila through the action of heat. It is a valuable gum and finds many applications in high grades of Coach Varnishes, either used alone or associated with Zanzibar or XXX Kauri.

BENGUELA RESIN COPAL:

#348. Like Angola, this is another variety of Copal Resin which presents about the same peculiarities and general characteristics; its color is yellowish; it is a little harder than Angola and mixes with it in a melted state in almost any proportion.

Benguela gum possesses to the highest degree the quality which is known to Varnish makers under the name of "toughness". It stands, therefore, a much larger quantity of thinners and consequently it is especially adapted for making "RUBBING POLISHING VARNISHES".

The price of Benguela Copal is subject to market fluctuations, and varies between 40 cts. and 50 cts. per lb.

Benguela Gum mixes well with almost any Copal, and is very valuable in high grade Furniture Varnishes.

KAURI GUM COPAL:

#350. Is far beyond question the most important of all Copal gums; in fact, no other fossil resin will take its place in the manufacture of Fat Varnishes, as it mixes with Linseed Oil much quicker and better than any other gum and at a lower temperature. It assimilates with Linseed Oil instantly in the Varnish kettle, while this cannot be accomplished with any other Copal Gum without "Cooking", even with those Copal gums which melt at a temperature lower than Kauri.

Owing to its comparatively low price and the peculiarity which it possesses, there is a tremendous consumption of this variety of Copal; and such is its importance as a raw material for Varnish making that no less than eighteen different sorts can be found in the New York market.

#352. New Zealand supplies the world with Kauri; the collecting, cleaning, sorting and packing is done there on a very extensive scale; and owing to the enormous consumption, it is to be feared that the Kauri fields will before many years be entirely exhausted.

Strange as it may appear, some 50 years ago the use of Kauri Gum from New Zealand was unknown, and Manila Gum had then the importance which has Kauri today. But owing to the extreme difficulty, not to say impossibility of preparing uniform Varnishes from the use of Manila Gum and the treacherous behavior of this gum

in the Varnish kettle, as soon as the peculiar working properties of Kauri were known, the use of Manila was almost entirely abandoned; and there is but very little of it used today comparatively to the amount which was used before Kauri had established its reputation.

Kauri is collected today in the province of Auckland. It is a fossil resin, which originally exuded from a pine tree and was subsequently altered chemically by long exposure in the earth.

The Borneo Copal and the Manila Copal present some analogy with the Auckland product. But in Varnish making, the New Zealand Kauri is preferred.

It is dug out from the earth in lumps which sometimes attain the dimensions of 4 cubic feet, weighing over 100 lbs.

There is not another kind of Copal resin presenting a wider range of value and a more diversified quality than the New Zealand Kauri Copal, as can be judged from the following list, which only represents the most important sorts of this gum sold in the New York market.

XXX Kauri.

XX "

X "

Pale Kauri well scraped #1.

Pale Kauri well scraped #2.

Pale Kauri chiseled.

Sorts free from chips and dust.

Kauri Pale Garblings.

Kauri Chips.

Kauri Brighter Chips.

Kauri Bright Dust (Clean).

Kauri Bright Dust.

Kauri Dark or Brown (No Dust).

PECULIAR CHARACTERISTICS OF KAURI:

#354. Kauri Gum is the best of nine-tenths of the so-called COPAL VARNISHES. There is a great variety of color. It is generally whitish; at least, this is the case in the highest grades which are branded XXX Kauri. The brand which is known as XX Kauri is a little darker, and presents a fracture streaked with opaque bands. The brand which is known as X Kauri is darket yet in color; its fracture presents darker streaks which are running through the lumps, and there are special sorts so dark that they present spots almost as black as Asphaltum, as if the gum had been subject in times gone to the action of forest fires.

The poorest quality of Kauri gum is often called No. 3 Kauri. This grade con ains extraneous substances insoluble in Linseed Oil; but even the poorest kind of Kauri Gum may produce a Varnish fully equal to the best possible combination of artificial products of gum resins associated necessarily with common rosin so as to get the mixture at the same low price as Kauri #3.

This remark has been made about Kauri; that immediately after being dug out of the ground, it seems to be whiter than after being kept two or three years in stock. This is attributed to the effect of the dampness of the earth. But if it is fact that Kauri becomes more yellowish with time, it becomes also much more transparent, which is an increase in value as it enables to produce Varnishes almost colorless. If we break a lump of Kauri Gum freshly dug out of the ground, we will find that it possesses a very peculiar and aromatic odor. After being kept two or three years in stock, in a perfectly dry place, if we break a lump of the same Kauri we will notice that this peculiar and aromatic odor exists to a less degree at the ordinary temperature; but if we heat previously Kauri to 180 deg. F., the aromatic odor will be developed to a considerable extent.

Zanzibar, Benguela, Angola, Sierra Leone, in fact all other Copals become gritty or reduced to powder when chewed; this is not the case with Kauri; it sticks to the teeth like Olibanum, like Mastic, like Coeruleum, rubber, Anime and Almadina Gum.

"356. The chief advantage of Kauri, as has been already said, and which has contributed more than anything else to the popularity of this gum, is its easy manipulation. Its affinity for Linseed Oil when melted and heated with it in the Varnish kettle, is another great advantage of Kauri;and its extreme abundance which is the cause of its low price will insure to this fossil resin an enormous consumption which will increase with new applications that this

gum finds almost every day. However, it must be said that the Varnishes of the highest grades, especially Wearing Body Varnishes, cannot be made from Kauri.

WEARING BODY VARNISHES must possess a hardness, toughness and durability which cannot be obtained from Kauri. For this reason, Sierra Leone and Zanzibar Copal, although much more expensive, will be used in preference for the highest grades of HARD DRYING BODY, WEARING BODY, ONE COAT COACH and BLACK RUBBING VARNISHES.

The specific gravity of Kauri varies with its purity, and ranges from 1070 to 1080; its point of fusion varies in the same proportion, and ranges from 375 deg. F. to 465 deg. F.

During the process of melting Kauri in the Varnish kettle, it can be noticed that a considerable amount of dampness and resinous matters are rendered volatil by heat and evaporated through the hood of the cover which is always placed on the Varnish kettle during the process of melting. The loss in weight which results from this preparation ranges from 15 to 30% of the original weight of Kauri. To this cause is due the yield of only 6 to 6 1/2 gals. per 100 lbs. of Kauri Gum. There is more Kauri Gum used in the United States than in the whole world outside of this country. Next to the United States, England uses the largest amount of Kauri. Commercially, the largest transactions of Kauri are made by England; the United States rank next.

MANILA GUM COPAL:

#358. This variety of Copal presents a secondary importance today in Varnish making. There are two sorts of Manila; one exceedingly hard, which is carred HARD MANILA; and the other softer than the common rosin, and which is called SOFT MANILA.

Both soft and hard Manila present peculiar characteristics of their own when melted in the Varnish kettle; their behavior in Linseed Oil, after having been melted, is so strange that to it is due most entirely the little use which is made of this gum nowadays. There is not a Varnish maker of some experience who has not been puzzled by the tricky characteristics peculiar to Manila. In fact, there are no fossil resins requiring more care, skill and experience in melting and cooking with Linseed Oil than Manila Gums.

HOW TO MIX AND MELT MANILA AND KAURI:

#360. Is yet a problem for many Varnish makers. Hard Manila gum presents one peculiar feature which is very valuable, especially in CHEAP FURNITURE VARNISHES. It gives a gloss entirely different from Kauri and almost glass-like, and at a price which cannot be duplicated from the use of any other material. For this reason alone Manila is an interesting rosin gum, and a considerable study has been made of various methods of melting it anf mixing it with other Copals. (See questions of melting and blending Varnish Gums.)

The addition of common rosin, or better, the addition of neutralized Rosin or Resinate of Glycerine, in the proportion of about 20% of the amount of Manila Gum, lessens a great deal the tendency of this Copal to "go back" in melting or after being melted. The association of French Artificial Kauri (see this artificial product) with Manila Gum will enable the Varnish maker to work safely; and the result will be, after thinning down either with Benzine or Turpentine, a Furniture Varnish not drying tacky.

FURNITURE VARNISHES are made today and sold at such a low price for second class work, that the Varnish maker must be familiar with all possible combinations of gums and resins, with or without the addition of Linseed Oil, if he wishes to meet competition successfully.

[illegible]. In the special chapter under the heading "QUESTIONS OF MELTING VARNISH GUMS" will be found many good points concerning the behavior of Manila and the manner in which it should be worked in the Varnish kettle. (See ADVANTAGES & DRAWBACKS TO BE EXPECTED FROM MIXING VARIOUS KINDS OF VARNISH GUMS & MELTING THEM TOGETHER IN THE VARNISH KETTLE.) (GUMS WHICH "WORK" AND THOSE WHICH "DO NOT WORK" TOGETHER).

[illegible]. The "Point of fusion" of Manila varies with the degree of softness of this gum, and ranges from 366 deg. F. to 405 deg. F. Manila Gum is quite heavy; its specific gravity is 1711 for the hardest sort, and about 1698 for the softest.

The SOLUBILITY of Hard Manila in Wood Alcohol is sometimes utilized in the preparation of wood surfacers for priming

or Liquid Fillers as a chemical substitute for Liquid Shellac.

Such Alcohol Manila preparations present a great defect in the application; they workf under the brush, or in other words, they don't flow. The Alcohol evaporates rapidly, leaving the Manila Gum with very little adhesive power to the surface. The drying is complete and perfectly hard after two or three hours, so that it can be rubbed or sand-papered. The addition of 20 to 25% of Fusel Oil to the Alcohol will make the preparation flow easier, more adhesive to the surface and cheaper.

Manila Gum is found in the market in ten or twelve different sorts, which can be classified in six prototypes, as follows:

MANILA EXTRA PALE CHISELED.

MANILA PALE A.

MANILA BROWN.

MANILA NUBS AND CHIPS.

MANILA CHIPS.

MANILA DUST.

Like the price of all other gums, the price of MANILA is subject to market fluctuations, and varies from 3 1/2 cts. per lb. for the CHEAPEST DUST, to 16 cts. for MANILA EXTRA PALE CHISELED.

IMPORTANT REMARKS COMMON TO ALL SORTS OF COPAL GUMS:

#370. If the name of Copal is given to a large variety of hard resins, such as ZANZIBAR, SIERRA LEONE, BENGUELA, ANGOLA, KAURI and MANILA, the behavior of all these gums presents a characteristic sometimes so different under the action of such or such solvent, vehicle , diluent or thinner, that it becomes absolutely necessary for the Varnish maker not only to become familiar with the effect of heat on these gums, but also to be perfectly acquainted with the affinity of melted Copals with the thinners in which they are diluted.

"COPAL VARNISHES" is a common and general name given to any solution of either Kauri, Manila or Benguela in prepared oil, in Benzine or in Turpentine. The range of value in Copal Varnishes is probably wider than in any other kind of Varnishes, as it can be seen from the numerous formulas of preparations further on described.

The hardest sorts of Copal have neither smell nor taste; only the soft varieties have a balsamic taste and an aromatic smell.

By grinding hard Copal to powder in presence of water, then allowing it to dry and exposing it to the action of the air, it becomes soluble in Alcohol. Copal dissolves in chloroform. It is almost insoluble at the ordinary temperature in Benzol.

GUM DAMAR:

#372. Is found in the market in drop-like masses of about the size of a walnut; sometimes also in larger pieces, exceedingly light in color.

If we break a lump of Damar Gum, we find that the fracture is perfectly smooth, with a yellowish reflect; this gum is used extensively for making label Varnishes, which have to be entirely colorless.

One objection against the use of Damar is the way it is affected and softened at a low temperature; only the warmth of the hand is more than sufficient to render Damar sticky. A Turpentine Varnish made from Damar as a gum, after being dry, is not any harder than a Rosin Varnish. By rubbing with the finger the surface of a fresh fracture of a lump of Damar Resin, a powder is formed instantly; and only at a temperature of 158 deg. F. Damar becomes entirely soft.

The melting point of Damar in the Varnish kettle is 310 deg. F.; it melts gradually, first becoming soft at a temperature of 110 deg. F.; then to the consistency of a paste at 160 deg. F.; at 210 deg. F. it forms a thick and viscous mass, and finally becomes entirely liquified at 310 deg. F.

Damar Resin dissolves with difficulty in Alcohol at the ordinary temperature; but if the Alcohol is heated, the Damar dis-

solves entirely.

#374. The manufacture of a Damar Varnish which will not dry tacky is a question of a great deal of interest, especially when the Varnish is intended for labels, as it will be entirely worthless should its use render the labels adhesive to each other. Damar Gum is an acid resin, which can be treated exactly in the same manner as common rosin with lime and glycerine. By this treatment it can be hardened; also by the use of Hydro Calcine or Lime Shells.

What is done generally for reducing the cost of Damar and at the same time preventing it from drying tacky, is to melt it with "French Artificial Kauri" in the proportion of 50%.

Water White Rosin previously neutralized and treated like FRENCH ARTIFICIAL KAURI, then thinned down with Turpentine, is a preparation known to the Varnish maker under the name of ESSENCE FOR DAMAR; it is to be mixed with pure Damar Resin in a proportion varying according to price.

#376. There are three sorts of Damar in the New York market:

1st. THE BATAVIAN DAMAR FROM JAVA.

2nd. SUMATRA DAMAR, FROM SUMATRA.

3rd. SINGAPORE DAMAR.

The price of this resin varies between 16 and 18 cts. per lb. for the higher grades, and between 9 and 11 cts. per lb. for common grades.

RESIN MASTICS:

#378. Have a great deal of analogy with Turpentine Rosins; they are found in the market in the shape of drops of a very light yellow color, covered with a white powder. The fracture of Mastic is vitreous. In burning, it develops an aromatic odor. The finest grades of Mastic present an opaline transparency. Resin Mastic is soluble in all proportions in ether at the ordinary temperature, and in Turpentine at a temperature of 190 deg.

This resin is cultivated in the Island of Chios, one tree giving only about a pound a year; so it is quite expensive. Book binder Varnishes are made from Mastic. This resin is in limited demand.

ELEMI RESIN:

#380. Is very seldom used alone in the manufacture of Varnishes; but it is frequently added in the proportion of 10 to 25% to other Varnishes exactly in the same manner and for the same reason as White Camphor Gum, as it prevents brittleness and cracking to a great extent. It is translucent and since formed by the agglomeration of very small drops together, it has a very strong smell somewhat like that of fennel-seed, which is due to the presence of an essential oil. Elemi Resin is an intermediary product partly soluble in cold alcohol, and complete soluble in alcohol heated near to the boiling point.

SANDARAC GUM:

#382. Is one of the best surfacers known; it is insoluble in water, very little soluble in ether and essential oils, almost entirely soluble in alcohol at the ordinary temperature, completely soluble in boiling alcohol.

Sandarac is seldom used alone, except in book-binders Varnishes. Associated with other Gums or Resins soluble in Alcohol, it finds many applications in the preparation of VARNISH STAINS and VARNISH LACQUERS.

The melting point of Sandarac is 270 deg. F.; it develops in melting a very aromatic odor.

Sandarac is sold in casks of about 300 lbs. at a price ranging from 20 to 23 cts. per lb.

TRAGACANTH GUM:

#383. Comes in the shape of small fragments and ribbons of white color. It is insoluble in alcohol, soluble in boiling water, and forming a mucilage very thick in cold water. It is used generally as a Size for making small tablets of color for artists.

It has a comparatively limited application and use. ALEPPO and TURKEY are the commercial names, according to the origin.

Price ranges from 30 to 50 cts. per lb., according to quality.

#388. TRAGACANTH GUM is found in the market in different sorts:

TRAGACANTH,	Aleppo,	1st Flake,	47 - - -	49 cts.
"	"	2nd "	35 - - -	40 "
"	"	3rd "	30 - - -	35 "
"	Turkey,	1st "	70 - - -	75 "
"	"	2nd "	47 1/2 -	52 1/2 cts.
"	"	3rd "	37 - - -	42 cts.

The above prices are subject to fluctuations.

ARABIC GUM:

#390. Although Arabic Gum has its applications entirely different from those above mentioned in the manufacture of Varnishes, this gum is of interest especially in the production of Sizes, Mucilages, Cements and specialties belonging to a certain extent to the Varnish line.

This article is found in the market under the following names:

1st Picked Commanos - - - - -	82 1/2 cts. per lb.
2nd - - - - - - - - - - - - - -	57 to 65.
3rd - - - - - - - - - - - - - -	42 to 52
4th - - - - - - - - - - - - - -	30 to 45
5th - - - - - - - - - - - - - -	27 to 35.

ASPHALTUM:

#392. Under the name of ASPHALTUMS or BITUMENS are comprised quite a number of substances deriving from the decomposition of organic matters and mostly consisting of Carbonated Hydrogen and products more or less oxidized or nitrated. They generally appear in masses of a dark brown or dense black, seldom very hard, sometimes sticky, and more generally fragile, breaking very easily, presenting then a conchoidal fracture.

MELTING POINT, 150 deg. F.

BURNING POINT, 475 deg. F.

Burns with a filiginous flame, partially soluble in alcohol.

CHEMICAL COMPOSITION: According to Boussingault, it is composed of two well defined substances, ASPHALTENE and PETROLENE. The first can be considered as an oxidation of the second.

PETROLENE isolated from Asphaltum, dried in Chloride of Calcium and rectified, appears as an oleous fluid, slightly yellow, of a bituminous smell. Density 0,891 at 21 deg. centigrade, not solidifying at 12 deg. centigrade below zero.

BOILING POINT OF PETROLENE, 280 deg. centigrade; its chemical analysis leads to the formula C 20, H 32.

ASPHALTENE, which is obtained pure in volatilizing PETROLENE at a temperature above 250 deg. centigrade, is a black, brilliant and solid substance, which becomes elastic near 300 deg. cen

tograde and decomposes before melting; it is soluble in alcohol, burns like a rosin; its chemical composition can be represented by C 20, H 32, O 3.

#594. We give hereafter a few analyses of several samples of the most widely known asphaltum.

PERUVIAN ASPHALTUM FROM COXITAMBO, PERU.

Carbon - - - - - -	88.6
Hydrogen - - - - -	9.7
O and Az - - - - -	1.6

FRENCH ASPHALTUM FROM AUVERGNES.

Carbon - - - - - -	76.I
H - - - - - - - -	9.4
O - - - - - - - -	10.3
Az - - - - - - - -	3.5

CUBAN ASPHALTUM.

Carbon - - - - - -	81.4
H - - - - - - - -	9.6
O and Az - - - - -	9.

The Utah Asphaltum is a composition about the same as the Cuban.

Owing to its light density, which varies between 0.7 and 1.02, Asphaltum floats most generally on the surface of water.

#396. There are three varieties of Asphaltum:

1st. LIQUID BITUMEN OR NAPHTHA, OF WHICH PETROLEUM IS ONLY A VARIETY.

2nd. MINERAL PITCH, which is a natural product identical with the above; but instead of being liquid, it has the consistency of solid tar. It is viscous or stick.

3rd. SOLID BITUMEN, from which are made the various compounds used for paving, also for roofing.

The best Asphaltum for Varnish making should be naturally very dry, its fracture very bright and conchoidal; reduced to powder, the powder should be of a brown red.

Asphaltum is more soluble in Benzine than in Turpentine.

If we drop a lump of Asphaltum in Benzine, this is immediately colored brown.

This coloring power is utilized in the manufacture of stains for making shades having the tint of walnut.

#398. NAVAL STORES - ORIGINAL QUOTATIONS SUBJECT TO FLUCTUATIONS.

ROSIN - - New York Standard Grading, per bbls. of 280 lbs.

A - Black - - - - -	1.00	4 - #1 - - - - - -	$1.25
B - Common Standard	1.00	1 - Good #1 - - -	1.35
C - Strained - - -	1.05	K - Low Pale - - -	1.75
D - Good Strained -	1.05	M - Pale - - - - -	2.20
E - #2 - - - - - -	1.10	N - Extra Pale - -	2.65
F - Good #2 - - - - -		W.G. - Window Glass	2.85
G - Low #1 - - - -	1.20	W.W. - Water White	3.15

-:-:-:-:-:-:-:-

TAR.

Ordinary Barrel, best cooperage, per bbl. - - - $1.60

Half bbl. strained - - - - - - - - per gal. - - - .10

-:-:-:-:-:-:-:-

PITCH.

Per barrel, 280 to 300 lbs. - - - - - - - - - - - $1.60

-:-:-:-:-:-:-:-

GUM THUS.

Per barrel, 280 lbs. - - - - - - - - - - - - - - - - - - $3.25

-:-:-:-:-:-:-:-

SOLUBLE PINOLEUM.

For ship dip, per gal. - - - - - - - - - - - - - - .25

PART No. IV

(See Index on the next page.)

SUBJECT TREATED.

OXIDIZING AGENTS, CHEMICAL DRYERS

and

INERT MATERIALS.

Part No. IV.

OXIDIZING AGENTS, CHEMICAL DRYERS

A N D

INERT MATERIALS.

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OXIDIZING AGENTS, CHEMICAL DRYERS
A N D
INERT MATERIALS.

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#400. The oxidizing agents, chemicals and inert materials used in the preparation of oils and the manufacture of Varnishes, Japans and Dryers, are:

1st - - - - - - Borate of Manganese.

2nd - - - - - - Oxalate of Manganese.

3rd - - - - - - Sulphate of Manganese.

4th - - - - - - Manganese Binoxide.

5th - - - - - - Granulated Manganese.

6th - - - - - - Recovered Manganese.

7th - - - - - - Borax.

8th - - - - - - Borate of Lime.

9th - - - - - - Borate of Zinc.

10th - - - - - - Acetate of Lead.

11th - - - - - - Litharge.

12th - - - - - - Red Lead.

13th - - - - - - Sulphate of Zinc.

14th - - - - - - Sal Ammoniac.

15th - - - - - - Caustic Soda.

16th - - - - - Hydro Calcine.

17th - - - - - Lime Shells or Prepared Lime.

18th - - - - - Raw Umber.

19th - - - - - Nitric Acid.

20th - - - - - Muriatic Acid.

21st - - - - - Ground Glass.

22nd - - - - - Whiterite.

23rd - - - - - Sand.

24th - - - - - Wood Pulp.

#410. It is a wrong policy in the preparation of oils and in the manufacture of Varnishes not to use oxidizing agents and chemicals of the highest standard of purity. Especially the BORATE OF MANGANESE should be chemically pure. This chemical enters as a most important factor in the preparation of LIGHT PREPARED OILS intended for good grade Varnishes.

#420. OXALATE OF MANGANESE has been of late recommended; but the adventages of the Oxalate have not yet been demonstrated.

SULPHATE OF MANGANESE is not so energetic in its action as BORATE, but it constitutes a good dryer, in some instances giving whiter oils.

#430. For FURNITURE OILS, also named LEAD OILS or QUICK DRYING OILS, the use of LEAD OXIDES is preferred as it gives the "Quickest Drying" Oil that can be made, the only objection being the darkness of the result.

#440. COACH OILS, JAPANS and DRYERS are treated preferably with Black Oxides of Manganese. There are three grades sold:

1st. THE PURE BINOXIDE OF MANGANESE.

2nd. THE GRANULATED MANGANESE.

3rd. THE RECOVERED MANGANESE.

SULPHATE OF ZINC and LIME are used principally in the treatment of rosin preparations or to harden rosin.

#450. BORAX and SAL AMMONIAC are used in the preparation of special dryers.

MURIATIC and NITRIC ACID are used to intensify the bodying of oils and dryers, and also to act as oxidizing agents.

GROUND GLASS, WHITERINE, SAND and WOOD PULP are used as clarifying agents.

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SOME REMARKS ABOUT THE VARIOUS GRADES OF
OXIDES OF MANGANESE USED BY
VARNISH MAKERS.

There is quite a considerable use made of Oxide of Manganese in the manufacture of Japans, Dryers, Drying oils and Varnishes. Oil boilers are also using quantities of it.

Oxide of Manganese, also named by Varnish makers Black Oxide, Granulated Manganese, Recovered Manganese, is found in the market at various prices.

ORIGINAL QUOTATIONS OF ALL GRADES OF OXIDES OF MANGANESE used BY OIL BOILERS AND VARNISH MAKERS.

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#460. The quotations here below are from manufacturers, but they are subject to slight market fluctuations.

#1 - Black Oxide of Manganese, best crystallized and finely ground, price per lb. - - - - -	5 cts.
#2 - Black Oxide of Manganese, also called granulated or pea size, or #12 Size, is exactly the same material as the above, the only difference being that it is not finely powdered -	5 cts.
#3 - Black Oxide, medium quality (coarsely powdered) -	3 cts.
#4 - Black Oxide medium quality, Granulated or #6 size - - - - - - - - - - - - - - - - - - -	3 cts.

#1 and #2 are the kind and grades generally used by Varnish makers and Linseed Oil boilers. This article should test at least 90% of Manganese. The #3 and #4 are inferior in quality, and may be used in cheap Black Varnishes. They generally contain from 70% to 72% of Manganese.

OLEATE OF LEAD AND OLEATE OF MANGANESE

as

OXIDIZING AGENTS IN PREPARING OILS AND MAKING VARNISHES.

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#480. The manufacture of OLEATE OF LEAD and OLEATE OF MANGANESE is conducted on a very large scale by the firm of Dr. Mohn & Co., Chemische Fabrik, at Dusseldorf, Germany.

As oxidizing agents, these chemicals are extensively used in the preparation of oils entering into the manufacture of Varnishes, and especially in the preparation of ELASTIC OIL CLOTH. They are readily "taken up" by Linseed Oil at a temperature of 300 deg. F., and leave no residue or considerable less residue than BORATE OF MANGANESE.

They have a great advantage over ordinary oxidizing agents. The LEAD OLEATE does not darken the oil like LITHARGE or RED LEAD, and the MANGANESE OLEATE is almost entirely soluble.

10 lbs. of LEAD OLEATE are sufficient for 100 gals. of Oil.

5 lbs. of MANGANESE OLEATE give better results than 5 lbs. of BORATE OF MANGANESE.

Some of the formulas for the preparation of oils in the "ART OF VARNISH MAKING", call for a certain proportion of either LEAD or MANGANESE OLEATES.

PART No. V

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF SOLVENTS, VEHICLES AND THINNERS.

Part No. V.

QUESTIONS OF

SOLVENTS, VEHICLES AND THINNERS.

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QUESTIONS OF SOLVENTS, VEHICLES AND THINNERS.

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#500. Theoretically, there are many solvents that could be used in dissolving gums and resins; but practically, the number of those which interest the Varnish maker is very limited.

By order of importance to the American Varnish maker, they are:

1st - - - - - - Turpentine.

2nd - - - - - - Naphtha 63 deg.

3rd - - - - - - Wood Alcohol.

4th - - - - - - Benzole.

5th - - - - - - Acetone.

6th - - - - - - Grain Alcohol.

7th - - - - - - Alcoholized Benzine.

8th - - - - - - Camphorated Turpentine.

9th - - - - - - Camphorated Naphtha.

10th - - - - - - Paraffine Oil, 23 deg. gravity.

11th - - - - - - Rosin Oil.

12th - - - - - - Tar Oil, 14 deg.

13th - - - - - - Dead Oil.

14th - - - - - - Creosote.

15th - - - - - - Fusel Oil.

16th - - - - - Myrbane Oil.

17th - - - - - Ether.

18th - - - - - Chloroform.

19th - - - - - - Carbon Bisulphide.

20th - - - - - - Essence of Citronella.

Of the twenty solvents and diluents above mentioned, Turpentine and Naphtha rank first in importance; they are used to thin down to the proper consistency almost any kind of Oil Varnishes; and have also many applications as solvents of Resins and Gums like Damar, Asphaltum, etc.

#510. WOOD and GRAIN ALCOHOL, ACETONE, FUSEL OIL, ETHER and CHLOROFORM are mostly used as solvents for making Lacquers.

BENZOLE, ROSIN OIL, TAR OIL, PARAFFINE and DEAD OILS are principally used as diluents or thinners in the preparation of cheap Black Varnishes, Iron and Wood Preservatives, etc., made from Asphaltum or Roofing Pitch.

CREOSOTE, BENZOLE, TAR OIL and DEAD OIL are used as solvents of Aniline colors; also for making shingle stains.

MYRBANE and FUSEL OIL, with a small proportion of CITRONELLA are the best materials to use in Naphtha deodorizing.

CARBON BISULPHIDE and NAPHTHA are used for dissolving Para Rubber and making rubber solutions.

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F A C T O R Y S T O C K

O F

SOLVENTS, VEHICLES AND THINNERS

FOR USE IN VARNISH MAKING.

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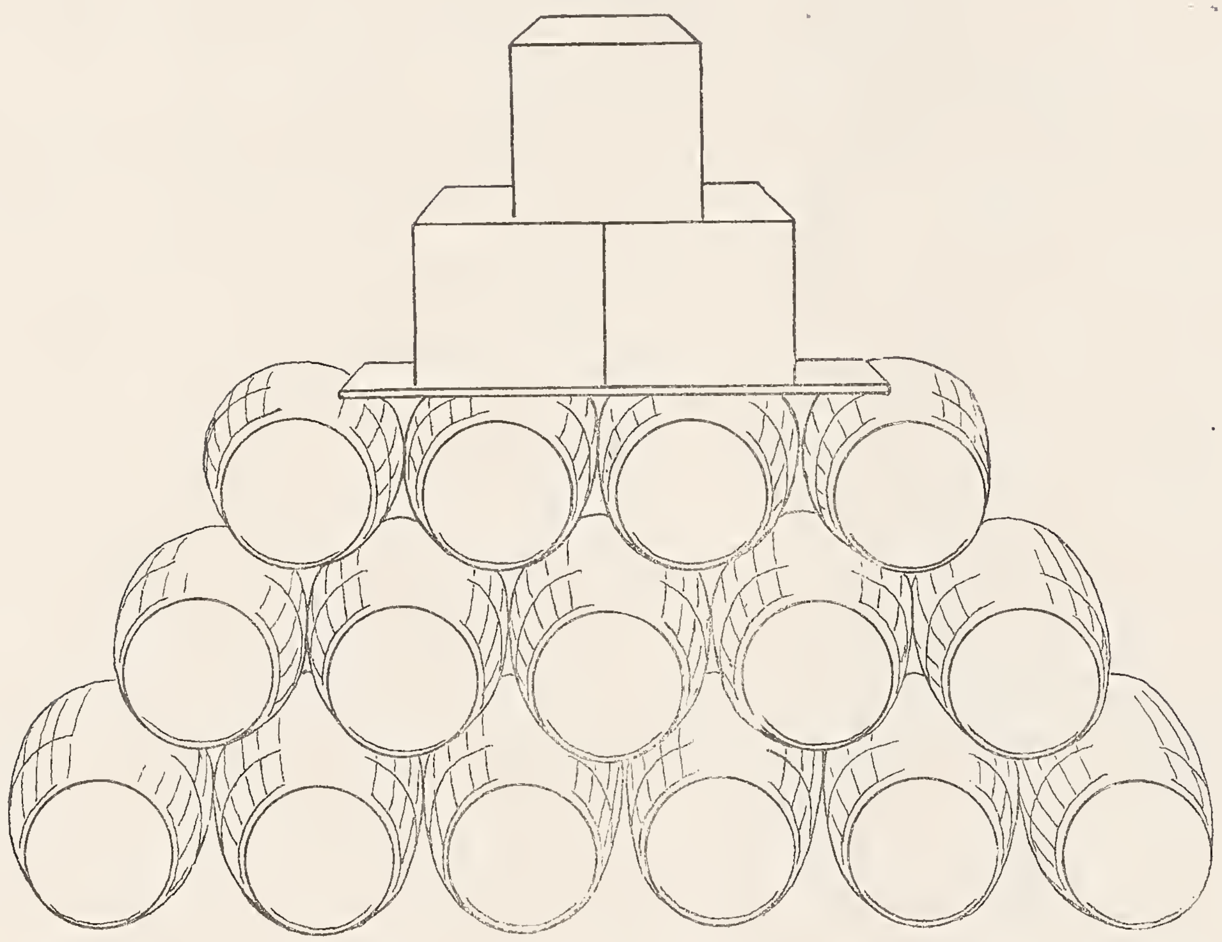
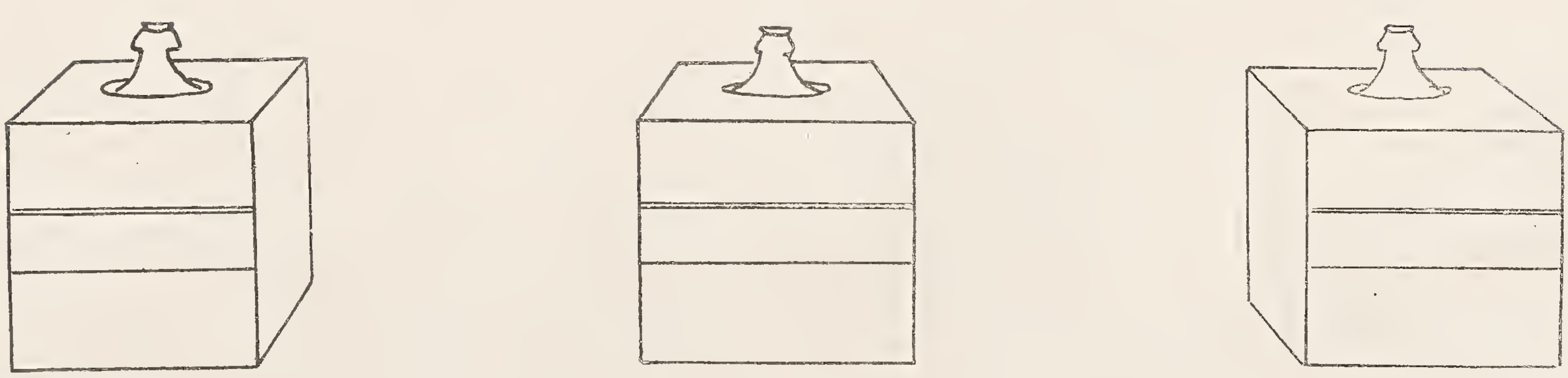
#520.





The above does not represent the entire collection of solvents, vehicles and diluents, but only those which are of the greatest importance in daily use.

PROCESS FOR DEBLOOMING ROSIN AND MINERAL OILS.

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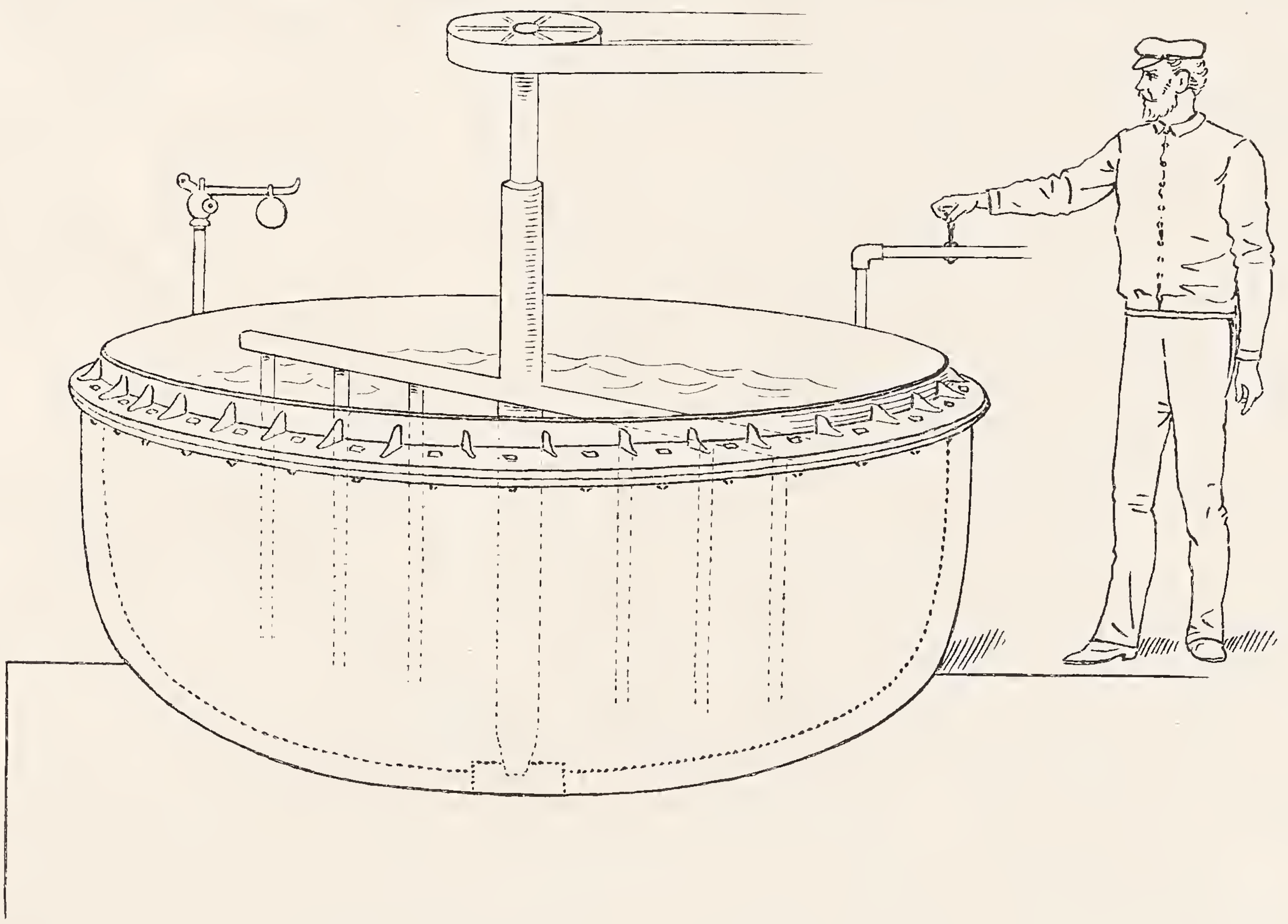
#550. The best material known for deblooming Rosin or Mineral Oils is NITRO-NAPHTHALENE.

Put in a copper pan or a steam jacketed kettle provided with a mixer or a stirrer, 100 gals. of the oil. Turn on steam



and bring the oil to a temperature of about 180 deg. F. Then shut the steam off and add 6 lbs. of NITRO-NAPHTHALENE; let the mixer run for about half an hour, more or less, until the whole NITRO-NAPHTHALENE has been thoroughly incorporated; then carry the contents into a settling tank to clarify, which requires about 24 hours.

PROCESS FOR BODYING BENZINE OR TURPENTINE.

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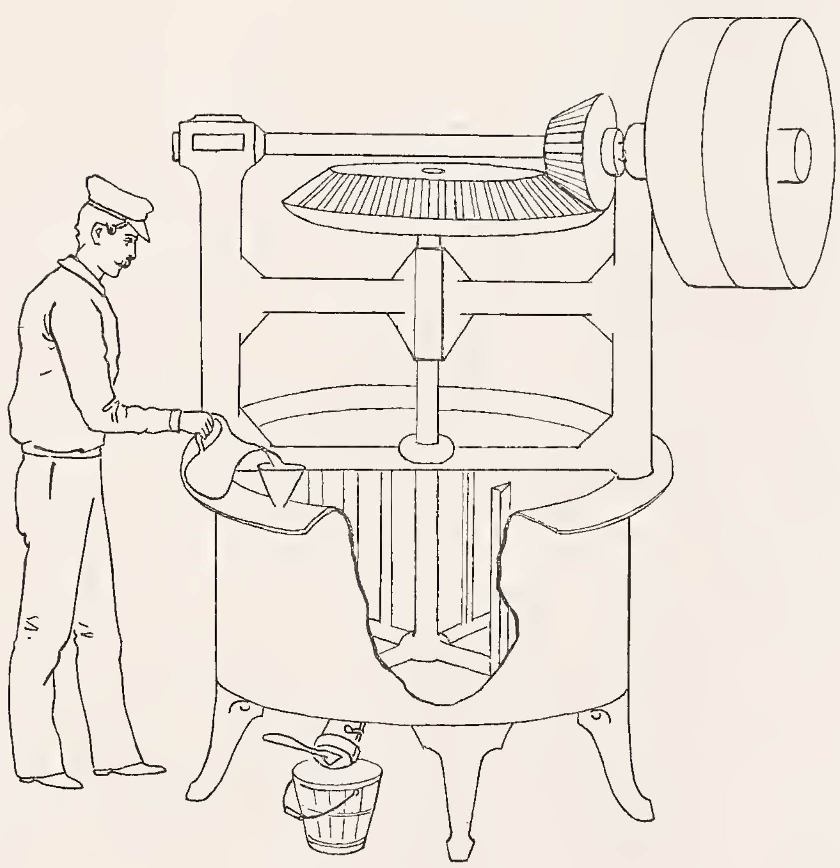
#540. The peculiar characteristic of Rubber to dissolve partially in Turpentine and Benzine, and impart viscosity or body to these solvents, has been utilized in the production of an oily vehicle which is often named RUBBER OIL, and which is nothing but a solution of rubber in the above diluents.

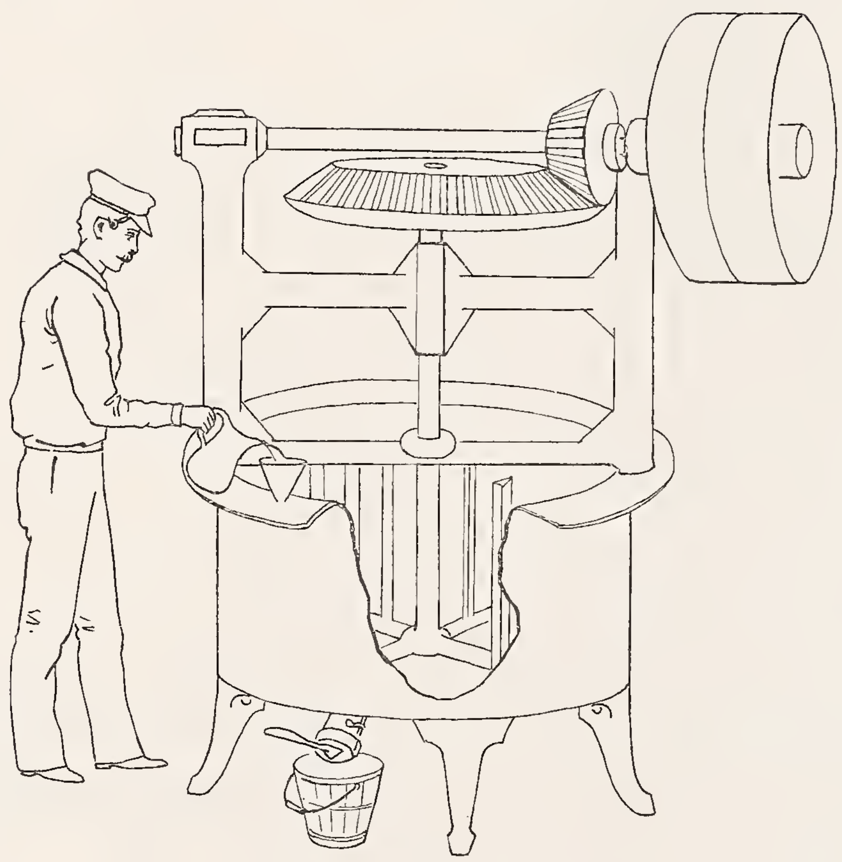


#550. Pure Para Rubber is placed in a mixer, such as the one above; then it is covered with Benzine or Turpentine and allowed to stand over night.

The day after, the Para Rubber will have considerably increased in volume, forming a mucilaginous paste similar to that

which is obtained when 1 lb. of Gelatine is allowed to stand over night in cold water.

The day after, if we start the mixer and let it run for half an hour, this will produce first a thorough mingling of the Rubber, and finally a thick jelly perfectly homogeneous and capable of being thinned down with 100 parts in volume of either Turpentine or Benzine for every one part of Rubber Jelly. One lb. of PARA RUBBER is all that is necessary for producing 100 gals. of RUBBER OIL.



RUBBER OIL made either from Benzine or Turpentine should be kept in stock for thinning down, instead of ordinary Benzine or Turpentine. It contributes to increase the flowing, and in certain cases prevents brittleness; for instance, in Asphaltum Varnish.

CAMPHORATED TURPENTINE OR BENZINE:

#560. Varnish makers should always have in stock for use when needed, a certain amount of Camphorated Turpentine or Camphorated Naphtha.

There are many uses for this preparation in making Lacquers, Leather preservatives and Elastic Varnishes.

#560. In making cheap Asphaltum Varnishes, the use of Camphorated Benzine or Camphorated Turpentine will impart elasticity to the Asphaltum and prevent it from cracking when dry; it will increase the adhesive power of Asphaltum Varnish.

The same advantages will be derived from the use of Camphorated Benzine or Turpentine, instead of the ordinary article in the manufacture of Grinding Japan.

The preparation of Camphorated Benzine or Turpentine is very simple and requires no melting of gum nor heating.

In an ordinary petroleum barrel, or (if larger quantities are needed at a time) in a large vat, place 45 gals. of TURPENTINE or NAPHTHA. Add to it 9 lbs. of GUM CAMPHOR. Mix well for five

minutes; then place a loose wooden cover on the barrel and allow the preparation to stand undisturbed over night.

The day after, the entire amount of Camphor Gum will have dissolved in the Naphtha just as pure sugar in water, giving as a result a water white solution.

This is the Camphorated Benzine or Turpentine according to the solvent used.

This preparation will find quite a number of applications in the manufacture of Fat Varnishes and Lacquers. In the "ART OF VARNISH MAKING", when a formula calls for Camphorated Benzine or Turpentine, this is the material intended to be used.

As a thinner in place of ordinary Naphtha or Turpentine, this preparation imparts to Varnishes and Lacquers some of the most valuable features of the highest price goods, and especially an artificial flowing that only RIPENESS, MATURATION or AGE could give.

CAMPHORATED NAPHTHA imparts to a Varnish the peculiar properties of Turpentine, as far as flowing is concerned.

PART No. VI

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF DEODORIZING VEHICLES AND SOLVENTS.

Part No. VI.

Q U E S T I O N S

O F

DEODORIZING VEHICLES AND SOLVENTS.

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QUESTIONS OF DEODORIZING VEHICLES AND SOLVENTS.

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NAPHTHA DEODORIZING:

#600. Many attempts have been made to deodorize Naphtha completely, but none has been successful from a practical standpoint.

The best result that can be obtained consists in neutralizing the pungent smell of Naphtha by a more pungent smell of an entirely different nature, as per process hereafter described.

#610. In a petroleum barrel perfectly clean and provided with a wooden faucet about two inches from the bottom, first put in 40 gals. NAPHTHA. Then add to it under constant stirring, 1 gal. of ACETIC ACID 8 deg. Then mix thoroughly together in an ordinary pail P, 1 gal. FUSEL OIL, 2 lbs. MYRBANE OIL, 4 oz. ESSENCE OF CITRONELLA.

When these three ingredients have been mixed to-

gether, add the whole contents of the pail to the 40 gals. of NAPHTHA, and use the wooden stirrer to perfect the mixture.

After thoroughly mixing for about ten minutes, let the preparation stand over night.

Day after, you will find at the bottom of the barrel and all around the part inside, a thick layer of a fatty substance com parable to oleomargarine; while all the soluble part of Fusel Oil, Myrbane and Citronella will have been "taken up" by the Benzine, and this at the same time will be found as clear as pure Alcohol.

The smell then will be found entirely different from the original smell of Naphtha, something like the odor of Acetone; and the Benzine thus prepared will be eminently suited to mix with Alcohol in the proportion of 2/5ths for making "Cheap Alcohol Substitutes", or for thinning down the Shellac Varnish Substitute, or imitations.

The above process is essentially practical, although it is not perfect. The production of Naphtha or Benzine entirely odorless by a practical process permitting to treat large quantities at a time, is a complicated problem for many chemists yet.

SIMPLE METHOD FOR SWEETENING THE PUNGENT SMELL OF WOOD ALCOHOL.

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#620. The following is an entirely new method, the value of which can be realized at once.

Pure Wood Alcohol possesses as a solvent about the same properties as Wine Spirit or Grain Alcohol. The strong pungent smell of Wood Alcohol is very easily noticed.

This pungency can be removed to a certain extent, so as to render Wood Alcohol sweeter and more like Grain Alcohol or Wine Spirit.

FORMULA AND PROCESS.

Put in a petroleum barrel, perfectly clean and placed on a platform about 16 inches from the floor, so as to allow room for a pail underneath:

40 gals. of WOOD ALCOHOL.

To this proportion of Wood Alcohol is to be added, under

constant stirring, a SCENTING PREPARATION the object of which is to sweeten; but the result cannot be noticed before six or seven days that the following mixture or preparation has been thoroughly incorporated with the Wood Alcohol.

The SCENTING MIXTURE should be prepared as follows:

In the pail underneath the barrel, 2 gals. of GRAIN ALCOHOL, or better, SPIRIT OF WINE, are thoroughly mixed with the small amount of ONE OUNCE OF FRENCH ESSENCE OF COGNAC.

After mixing this for about five minutes, the entire contents of the pail are added to the 40 gals. of WOOD ALCOHOL placed in the barrel, and then the whole mixture is allowed to stand undisturbed for about a week.

After a week, the preparation should be carefully removed through the faucet, which is 2 inches above the bottom, so as to permit the operator to get only the perfectly clarified and partly deodorized portion, without removing at the same time the strongly smelling residue or sediment which may be accumulated at the bottom.

F U S E L   O I L .

ITS USE AS A SOLVENT, TREATMENT AND APPLICATIONS. HOW TO REFINE CRUDE FUSEL OIL; DEODORIZING FUSEL OIL; ADVANTAGES AND DRAWBACKS DERIVING FROM THE USE OF FUSEL OIL.

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#630. The use of Fusel Oil in the preparation of certain solvents for GUM RESINS is only suggested by reasons of economy.

Every distillate, be it from grain or potato mash, contains more or less FUSEL OIL, which by its disagreeable odor and taste injures the flavor of the liquor; this FUSEL OIL as a residue of distillation can be bought at a price ranging from 15 to 25 cts. per gallon.

Fusel Oil is soluble in Alcohol and Ether, but not miscible with water; its solubility in Wood Alcohol is utilized in the preparation of cheap solvents and Alcohol Lacquers. A mixture of 50 per cent Fusel Oil and 50 per cent Acetone presents peculiarities as a solvent offering a special interest for preparing Shellac Varnish.

Fusel Oil as bi-product of the distillation of Grain Alcohol, finds extensive applications in manufacture; but as a material, solvent or diluent in making Alcohol Varnishes and Lacquers, its use is not always to be recommended.

The largest industrial application of Fusel Oil is in the

extraction of Paraffine; Sulphuric Acid is added, which forms a Sulphic Amylic Acid; and as Paraffine is not soluble in it, it is at once separated from its solution in Fusel Oil or Amyl, and rises to the surface, where it forms a thick layer.

As a solvent for gums or rosin gums, and especially as a solvent for Shellac, Fusel Oil cannot be used alone; its dissolving power is far from being sufficient, but it can be greatly increased by the addition of ACETONE or WOOD ALCOHOL. In the "ART OF VARNISH MAKING", Chapter XVII, I will give various formulas in which REFINED FUSEL OIL can be used in more or less proportion.

One of the most desirable features of Fusel Oil in the preparation of certain Lacquers or Alcohol mixtures, is the peculiar oily nature of this bi-product.

Twenty-five per cent of Fusel Oil added to a solution of Manila Gum in Wood Alcohol will improve considerably a Varnish thus made; it will retard the drying and increase the flowing. The more body or the heavier the Fusel Oil, the better will be the result, as far as elasticity and adhesiveness are concerned.

In other cases, it is just the reverse which is needed; or in other words, a light Fusel Oil, also called "REFINED FUSEL OIL", the smell of which is not so strong and penetrating.

CRUDE FUSEL OIL FROM THE DISTILLERY can be treated by the following method, and refined at a very little expense.

NEW METHOD AND PROCESS FOR REFINING

F U S E L O I L

Intended to be used as a solvent for resin gums.

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HOW TO NEUTRALIZE THE SMELL OF FUSEL OIL.

#640. In a petroleum barrel or a large vessel disposed as per cut, put 30 gals. of CRUDE FUSEL OIL, such as it comes from the distillery in the state of a residue, bi-product or waste; and add to it 2 qts. of Aqua Ammonia previously diluted in 5 gals. of cold water. Mix thoroughly during 10 to 15 minutes, and then allow the mixture to remain undisturbed until the following day.

In settling, gradually the solution of Aqua Ammonia will precipitate at the bottom of the barrel a large proportion of the BUTIRIC ALCOHOL and fatty substances which give to CRUDE FUSEL OIL its peculiar and pungent smell. If it was possible to precipitate

entirely the fatty substances above referred to, Amylic Alcohol would only remain; but it is impossible to eliminate them entirely by precipitation, so a certain proportion remain in the Fusel Oil after the treatment by Ammonia. The sediment produced must be removed the day after. When the supernatant Fusel Oil has been separated from the sediment, it is then treated in the following manner:

#650. ONE POUND OF SULPHURIC ETHER is added to the Fusel Oil and intimately mixed with it, under constant stirring.

This being done, the following preparation should be added to the mixture:

Myrbane Oil - - - - --	5 lbs.
Essence of Citronella	1 "
Essence of Cognac - -	1 1/2 oz.

Mix the three above ingredients thoroughly together, and add them gradually to the Fusel Oil.

The mixture of ESSENTIAL OIL and SULPHURIC ETHER to the Fusel Oil not only neutralizes the smell to a great extent, but considerably increases the dissolving power of Fusel Oil, rendering it fit for use in SHELLAC VARNISHES.

PART No. VII

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS ON LINSEED OIL CONSIDERED AS A RAW MATERIAL.

Part No. VII.

QUESTIONS ON LINSEED OIL

considered

As a raw material.

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TRANSLATION FROM THE FRENCH

OF IMPORTANT EXTRACTS FROM THE REPORT SUBMITTED TO THE CHAMBER OF COMMERCE, OF PARIS, BY MR. LEFEBVRE, ON THE SUBJECT OF TESTING THE PURITY AND BODY OF A RAW LINSEED OIL INTENDED FOR MAKING PREPARED OILS AND MANUFACTURING VARNISHES.

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#700. Linseed Oil, one of the essential elements of life in the manufacture of Varnishes, is far from being a well defined body or combination. Chemical analysis can trace in Linseed Oil only the elements which exist about to the same extent in almost any kind of Vegetable Oils, and such as Carbon, Oxygen, Hydrogen, Oleic Acid, etc.

But there are physical characteristics which only can be found in a PURE LINSEED OIL. These characteristics are very easily recognized, and not a great deal of chemical knowledge is necessary to become soon an expert in testing a pure oil when these peculiar characteristics have been properly examined as to their nature and their effects.

Consequently, we may state that chemical analysis will being no light whatever on the subject for instance of a Linseed Oil mixed with 25% Poppy Oil; while it becomes possible at a glance to detect this mixture of two different kinds of oil notwithstanding the fact that they are almost identical chemically;

and this can be done through the use of a little instrument which was exhibited in section 45 of the great Paris Exposition of 1889.

This little instrument is named an oleometer; its construction is exceedingly accurate, and at the same time very simple. The construction of this instrument is based upon the fact that Linseed Oil being the heaviest of all seed or vegetable oils, it is utterly impossible to mix any oil with pure Linseed Oil without reducing its density.

NECESSITY OF PURE LINSEED OIL IN THE MANUFACTURE OF VARNISHES:

#710. In the manufacture of Varnishes, it is absolutely necessary to use a Linseed Oil free from any other oil; otherwise, the highest degree of oxidation cannot be obtained, no matter how carefully an impure oil has been prepared.

No oil can be oxidized to the same degree as pure Linseed Oil; therefore, any admixture of other Vegetable Oils with Linseed or even of a seed different from Flax Seed in the manufacture of Linseed Oil, gives as a result an oil inferior to the standard for use in making Varnishes.

Calcutta Linseed Oil, on account of its freedom from mucilage, and the high temperature which it stands in the Varnish kettle without BREAKING, is used in preference to American Linseed Oil for making fine Varnishes.

HOW TO TEST PRACTICALLY PURE RAW LINSEED OIL AS TO FREEDOM FROM ANY OTHER OIL BY THE LEFEBVRE METHOD AND WITH THE OLEOMETER.

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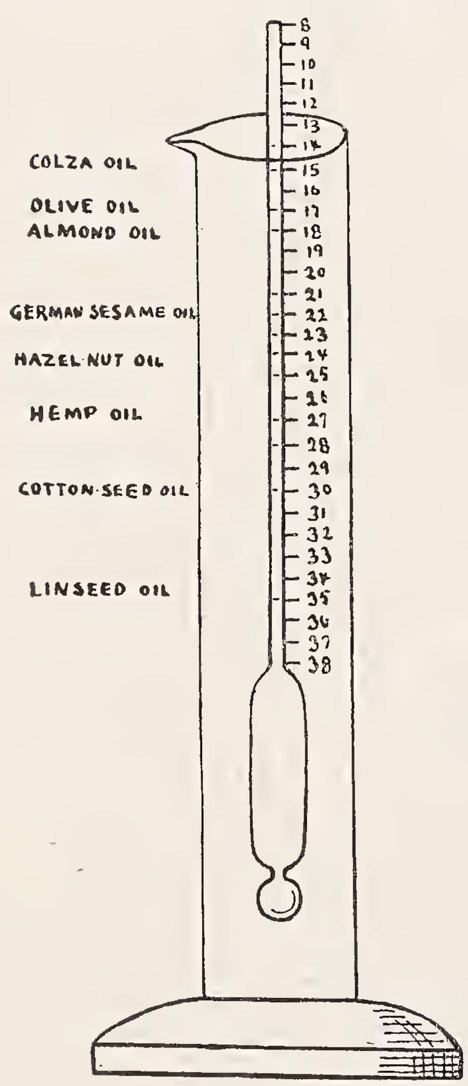
#720. In his report submitted to the Chamber of Commerce, of Paris, by the expert, Mr. Lefebvre, on questions relating to the practical tests of all sorts of vegetable oils, there are many points concerning especially Linseed Oil which cannot fail to be of the highest interest to American Varnish makers.



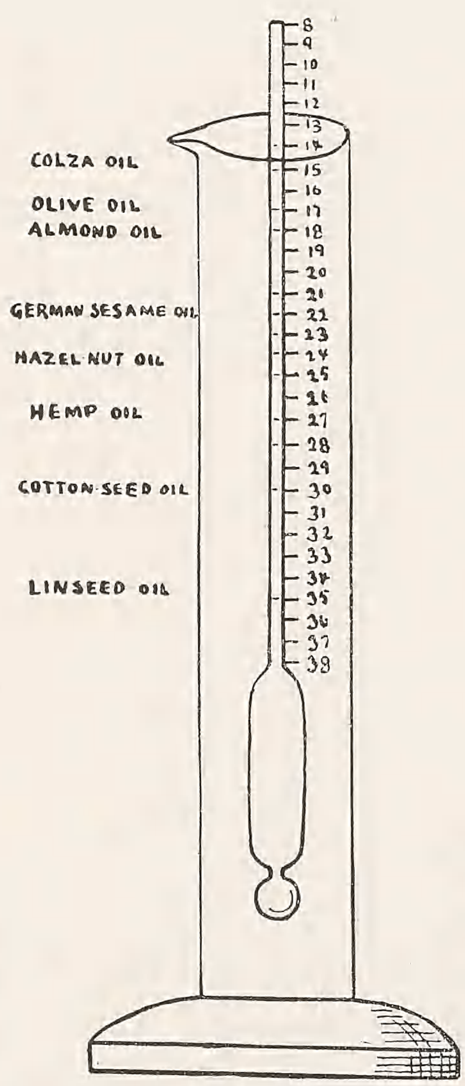
In presenting his report, Mr. Lefebvre presented also a small instrument having some analogy to an hydrometer and that he invented with a view to test all sorts of oils as to their specific gravity.

Pure Linseed Oil being the heaviest Oil deriving from a seed, this is the oil which possesses the highest specific gravity under the same conditions of temperature; should any other seed oil be mixed with it in any proportion, the specific gravity of the mixture will be consequently lower than the original specific gravity of pure Linseed Oil.

#730. The construction of the oleometer is based upon this

principle, so that it is only necessary to have a graduate such as the one described here below, and oleometer, to test the degree of purity that the specific gravity of said oil compared with Linseed Oil may indicate.

The instrument named oleometer has been previously tested with all sorts of oils, and graduated so that the name of the oils most important to commerce are indicated on the scale.



As the specific gravity of an oil varies greatly according to the temperature, the Oleometer of Lefebvre has been constructed considering the density of oils at a temperature of 59 deg. F.

Consequently, if we place an oleometer in a glass graduate containing Linseed Oil perfectly pure, the instrument will gradually descend to the mark corresponding to the specific gravity of Linseed Oil at a temperature of 59 deg. F.

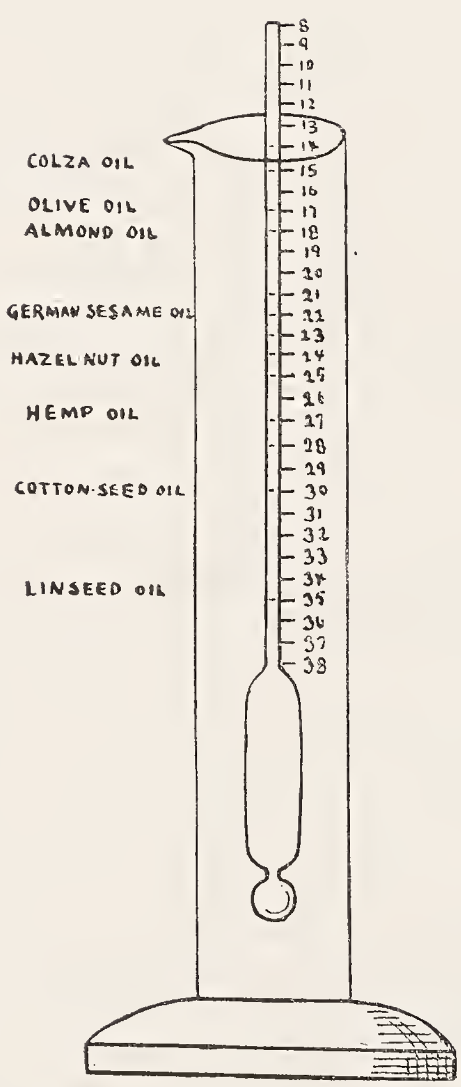
In order to enable anyone with a simple instrument such as this to test an oil as to its specific gravity, Mr. Lefebvre has very accurately determined, once for all, in a very elaborate work, the specific gravity of all sorts of oils corresponding to temperature.

All these tables of the specific gravities of oils can be

had with each instrument.

#740. The usefulness of an instrument such as this can be easily realized from the fact that it rapidly enables the Varnish maker to test Linseed Oil to a certain extent without having recourse to the light of a chemist.

For the paint manufacturer, an oleometer is perhaps more useful yet than to a Varnish maker.



By the use of it, as per cut, the Paint manufacturer is enabled to ascertain some of the following mixtures, which are so frequently found nowadays.

LINSEED OIL and ROSIN OIL.
LINSEED OIL " NAPHTHA.
LINSEED OIL " COTTONSEED OIL.
LINSEED OIL " FISH OIL.
LINSEED OIL " PARAFFINE OIL.
LINSEED OIL " KEROSENE OIL.
LINSEED OIL " NEUTRAL OIL.
LINSEED OIL " TURPENTINE.

The oleometer will not accomplish the work of a chemist in ascertaining mixtures of fixed and volatil oils; but it will greatly help in ascertaining the physical characteristics of the mixtures above mentioned from the standpoint of specific gravity.

PART No. VIII

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF BLEACHING OR REFINING LINSEED OIL.

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Part No. VIII.

QUESTIONS

ON

BLEACHING OR REFINING LINSEED OIL.

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BLEACHED OR REFINED WATER WHITE LINSEED OIL

BY

THE SULPHURIC ACID PROCESS.

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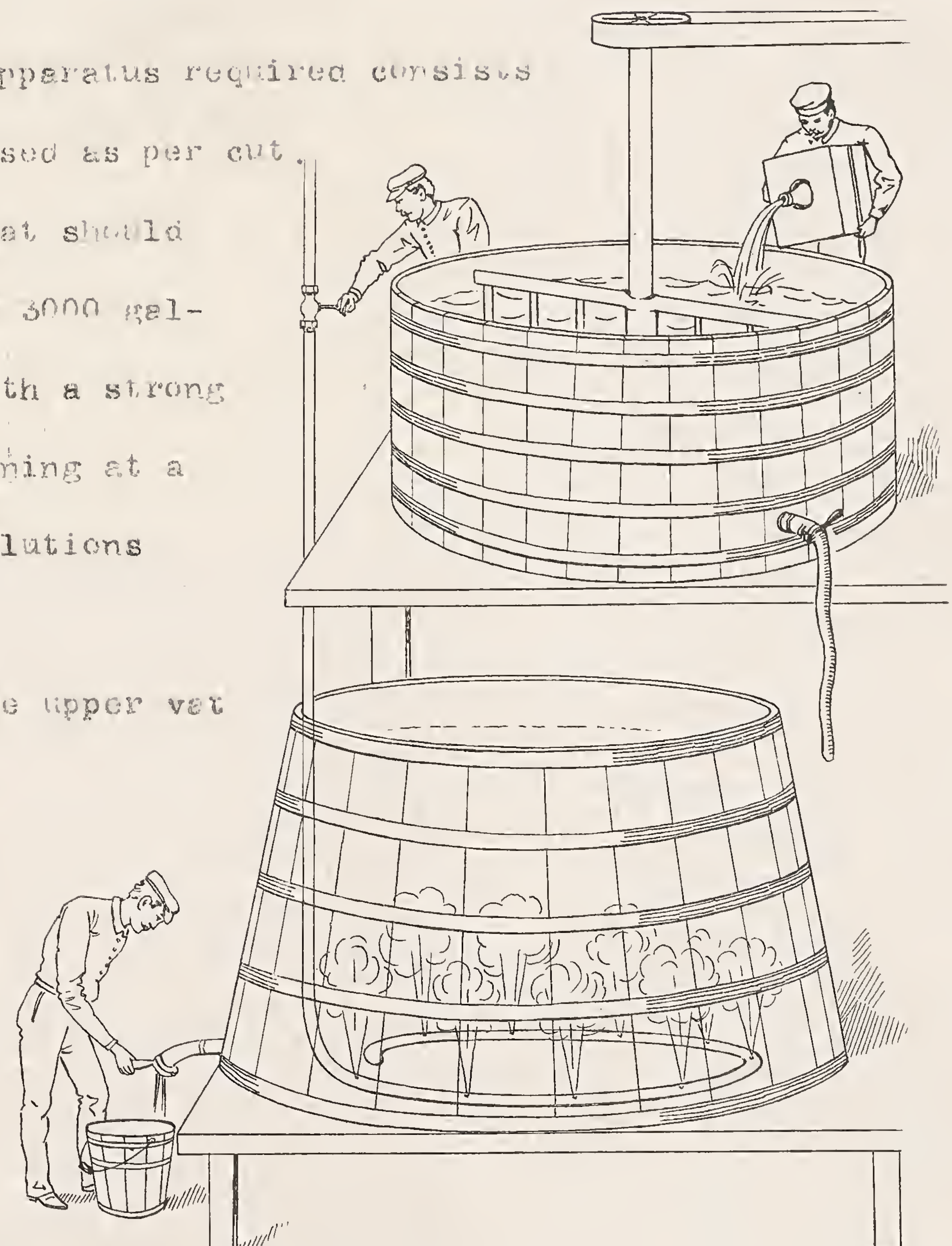


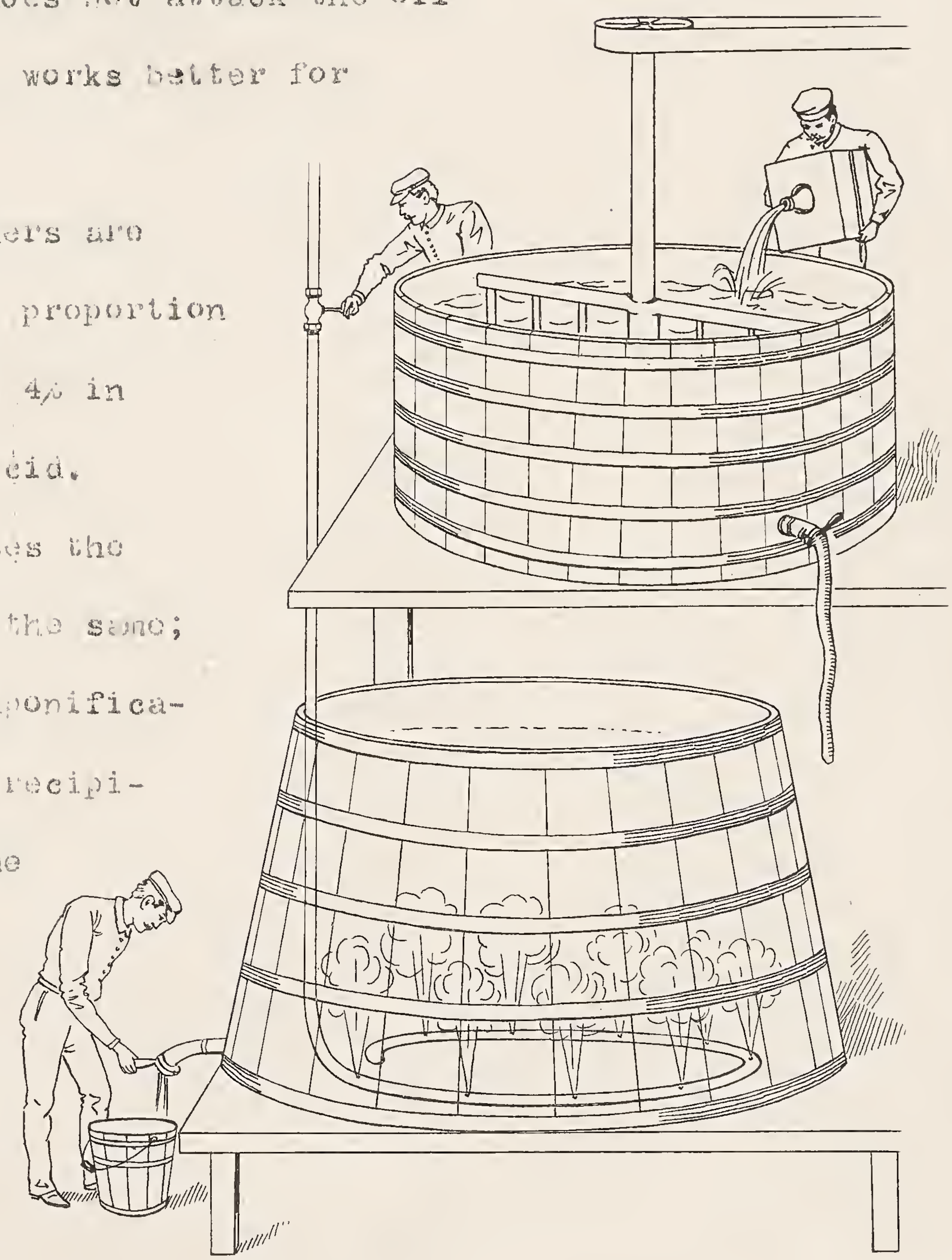
7800. The apparatus required consists of 2 large vats disposed as per cut.

The upper vat should be of the capacity of 3000 gallons, and provided with a strong stirrer or mixer, running at a speed of only 75 revolutions per minute.

Put into the upper vat 2000 gallons of RAW LINSEED OIL, such as received pure from the seed crushers.

While the mixer is in motion, add to the Linseed Oil a solution of Sulphuric Acid 66 deg. B., previously prepared by adding 300 lbs. of Sulphuric Acid 66 deg. B. to 100 gals. of cold water. This is the chemical which has a

bleaching action upon raw Linseed Oil. Instead of diluting the Sulphuric Acid 66 deg. B. with cold water so as to get only a weak solution, the strong acid could be put into the oil directly from the carboy, as per cut. But it is preferable to use the weak solution because it does not attack the oil so energetically, and works better for bleaching purposes.

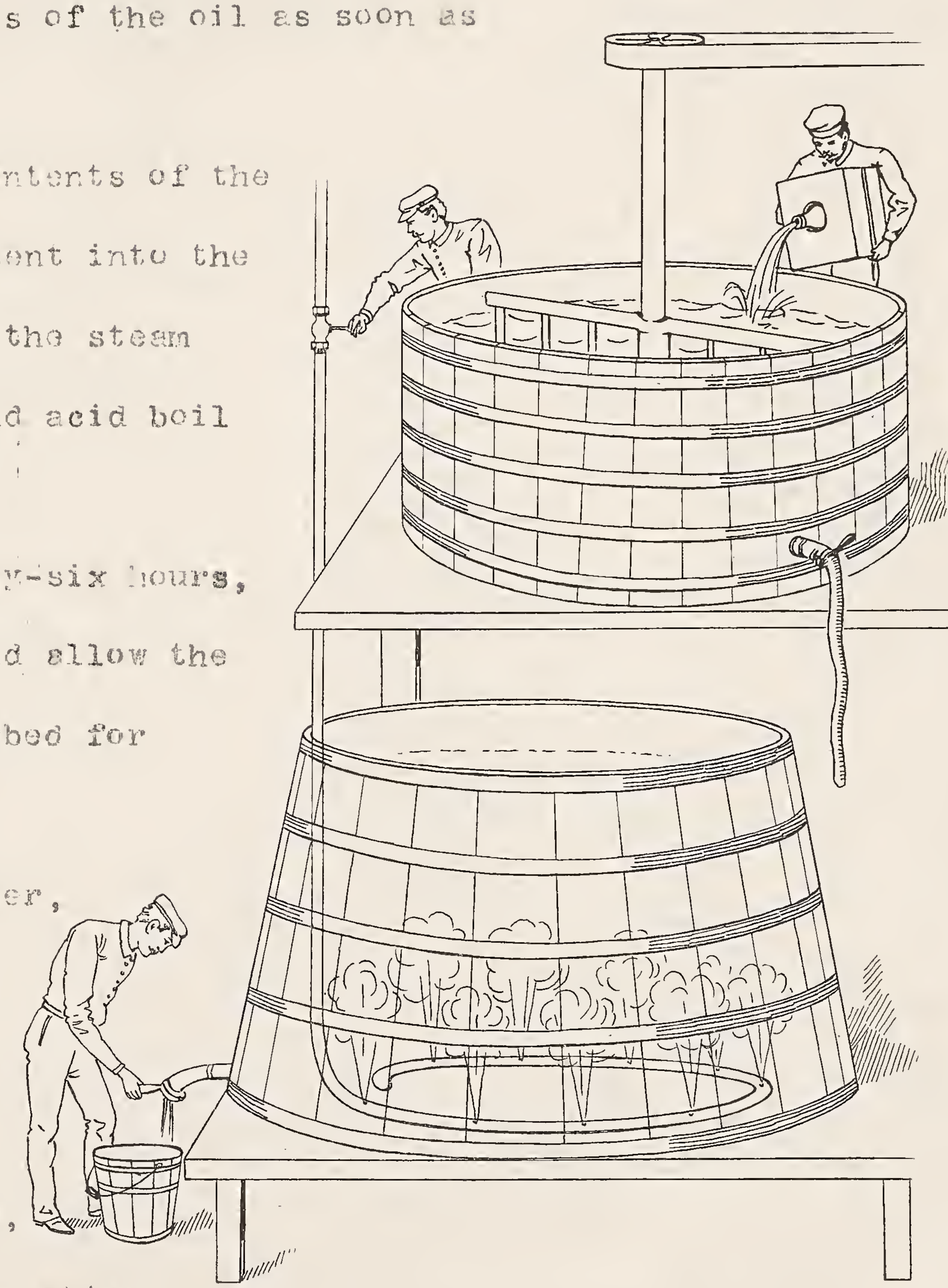


Some bleachers are using, instead of the proportion above indicated, only 4% in weight of Sulphuric Acid.

In both cases the result chemically is the same; there is a partial saponification produced which precipitates at the same time the yellowish coloring substance of the Linseed Oil.

The mixer should be kept in motion from 8 to 10 hours consecutively; and after 10 hours it is stopped, and the whole contents of the upper vat are carried or allowed to run in the large steaming vat placed underneath.

This steaming vat should be lined with lead and provided with a steam coil placed at the bottom, with little holes allowing free passage to the steam, the end of the coil being closed. Through this arrangement, the steam is distributed uniformly through the whole mass of the oil as soon as the valve is open.



When the contents of the upper vat have been sent into the vat underneath, turn the steam on and let the oil and acid boil thirty-six hours.

After thirty-six hours, turn off the steam and allow the oil to stand undisturbed for twelve hours longer.

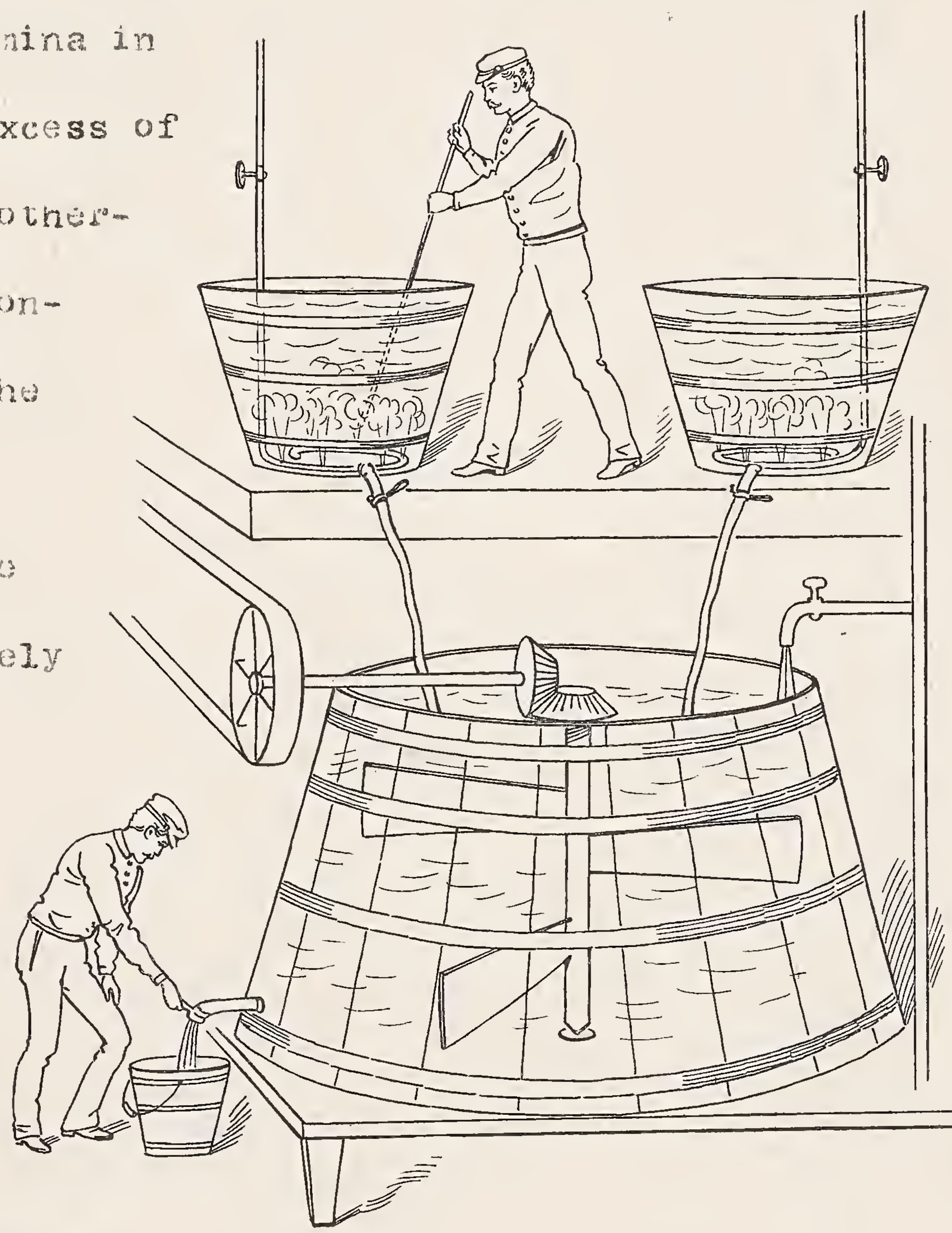
The day after, all the water, Sulphuric Acid and impurities will have settled at the bottom, while the Linseed Oil, which is of a less density, will float, perfectly clarified, bleached and almost water white.

It remains now only to take off the oil, which is done through a faucet placed just above the surface of the sediment.

FRENCH PROCESS OF BLEACHING RAW LINSEED OIL BY THE USE OF HYDRATE OF ALUMINA.

#810. This process is based upon the peculiar property of Hydrate of Alumina (recently precipitated) to take hold of a coloring principle and form a Lake with it.

A great deal o.. care should be exercised in the preparation of the Hydrate of Alumina in jelly. There must be no excess of Alkali in it, as it would otherwise produce a partial saponification or emulsion of the oil which would spoil it. So it is better to make the Hydrate of Alumina separately and keep it in stock for future use.



The Hydrate of Alumina is very simple to prepare properly, by the following method.

The apparatus required is plainly described, per above cut.

Two upper vats, 150 gallons each, provided with

steam pipe and a large vat underneath of about 700 gals. Taps as shown. Bottom tub to be high enough to place a pail underneath.

Put into each one of the top vats 90 gals. of water; bring it to a boil. When water is boiling, put into vat No. I, 90 lbs. of CRYSTALLIZED ALUM, and stir until dissolved; then fill up to the top.

Put into vat No. 2, 30 lbs. of CARBONATE OF AMMONIA, and fill up to the top.

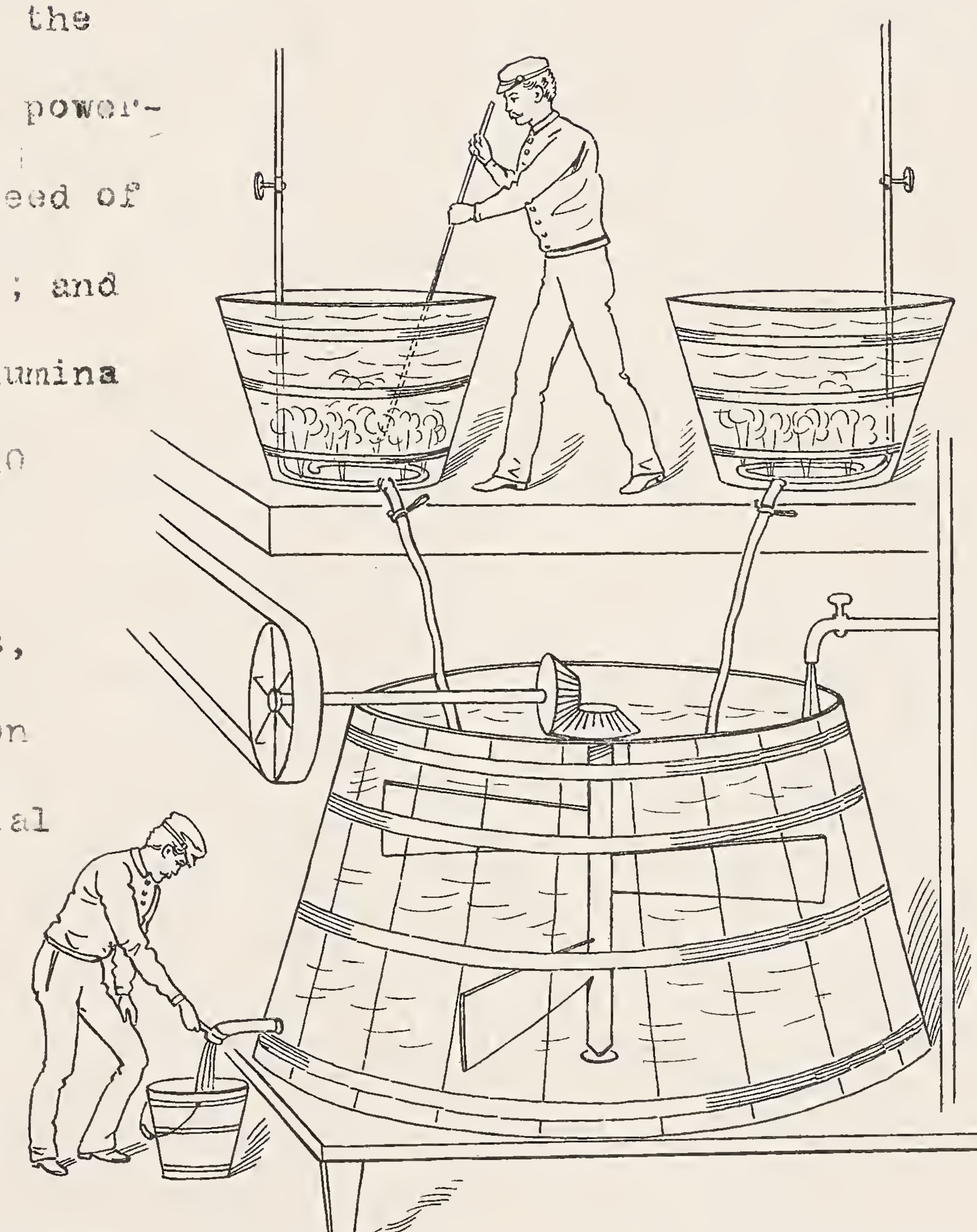
Then let the CARBONATE OF AMMONIA solution run down into the large vat underneath, and immediately after, allow the ALUM solution to run into the AMMONIA LIQUOR gently and under constant stirring.

The mixture of the two liquors or solutions produces a cloudy and thick precipitate of Hydrate of Alumina. Fill the large vat up to the top with clear water, then allow to settle until the next morning; take off the washing water, fill up to top again

give another washing, so as to eliminate all the Alumina, then let settle and keep in stock the thick precipitate of Hydrate of Alumina for future use.

The quantity of Hydrate of Alumina obtained by the process above described, will be sufficient for the treatment of 500 gallons of Linseed Oil.

It is sent into the large vat provided with a powerful mixer running at a speed of 75 revolutions per minute; and the mixture of oil and Alumina kept in motion for 8 to 10 hours. Then the mixture is sent to a filter press, where a perfect filtration takes place through special felt paper. The Alumina is separated from the Oil, while this with a certain quantity of water passes through the filtering paper and afterwards is allowed to settle in another vat, where the water forms a sediment from which the oil can be easily separated.



Satisfactory results can be obtained in purifying Linseed Oil by this method.

The Oil thus treated has more "Body" than when it is refined by the Sulphuric Acid process. The only objection to it is the amount of residue or waste, which is greater than by the Sulphuric Acid process.

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SPECIAL PROCESS FOR BLEACHING LINSEED OIL BY THE COMBINED USE OF FULLER'S EARTH, GROUND GLASS AND HYDRATE OF ALUMINA.

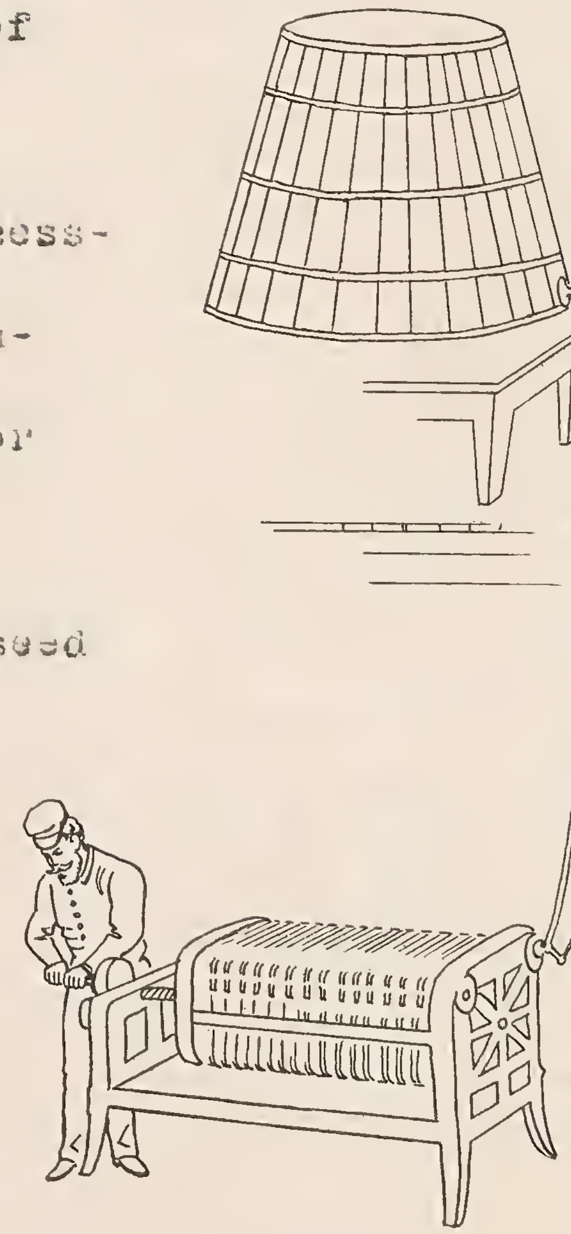
#320. A more thorough bleaching can be obtained by adding a certain amount of FULLER'S EARTH, about 75 lbs., previously mixed with 25 lbs. of GROUND GLASS. This mixture of inert materials has no chemical action on the oil, but acts mechanically as a cleansing agent.

FULLER'S EARTH possesses as a bleaching agent of an oil, some of the peculiar properties of pure Carbon. Pure Carbon is certainly the best bleaching agent known for fatty substances; but the process of filtering through it is so slow that it is not practical. Fuller's Earth allows a quicker passage through filtration on account of its porosity.

As a cleansing agent for Varnish oils, Fuller's Earth can be used as a clarifying material instead of Lime Shells.

NEW MECHANICAL PROCESS FOR BLEACHING, FILTERING AND CLARIFYING AT THE SAME TIME, IN ONE SINGLE OPERATION, RAW LINSEED OIL, WITHOUT THE USE OF SULPHURIC ACID OR ANY OTHER CHEMICAL.

#330. There is only one serious objection to the use of Sulphuric Acid in bleaching or refining raw Linseed Oil. The specific gravity is somewhat reduced, which means a loss in "body" or flowing, two of the most desirable features of Linseed Oil.



Attempts have been made, but unsuccessfully, to bleach or refine raw Linseed Oil under a process of filtering through charcoal or animal black, then through "Pyrolusite".

This process gives a beautiful Linseed Oil, perfectly bleached and almost water white; but the filtration goes on so slowly, that for the treatment of large quantities of Linseed Oil at a time, this method is not practical.

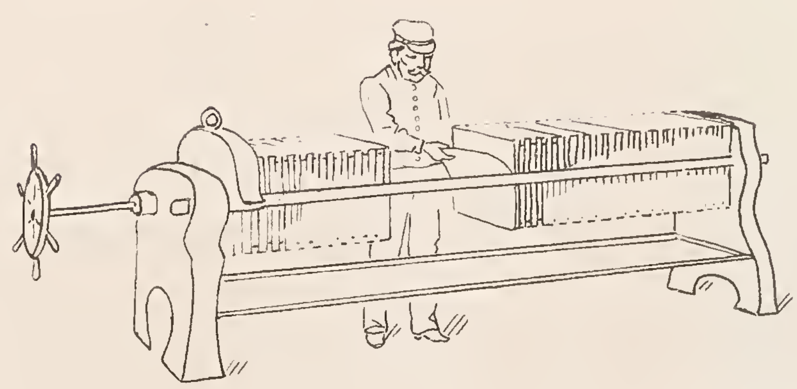
It is possible, however, to utilize the advantage of charcoal or animal black by its application to the filter press, and filtering under pressure through a paper especially made with this object in view.

This paper is prepared by adding to the pulp a certain

quantity of "Pyrolusite", Charcoal and Animal Black, and is manufactured for filtering purposes in Germany.

The filtering process is exactly the same as the ordinary process of the filter press; 3 to 8 thicknesses of paper are used at a time between each chamber of the press; and as the operation can be conducted rapidly, it is then possible to filter two or three times the same oil.

Only one single filtering gives a very good result; the oil is not only filtered but also bleached; and the result, as far



as "Body" and "Flowing" are concerned, is superior to the result obtained by the Sulphuric Acid process.

This new principle of filtering and bleaching an oil through one single operation is very simple and exclusively mechanical.

The carbon paper can be bought from a New York house which imports it directly from Germany; and as the very same paper can be used for filtering at least 5000 gals. of oil through a filtering press, the cost of filtering is very small. As to the result, it is as good as by the use of Sulphuric Acid.

SOLAR ACTION: ITS APPLICATION TO BLEACHING LINSEED OIL.

#840. How to bleach large quantities of Linseed Oil at a time by the direct action of solar light, is a very important question which has not yet been solved satisfactorily.

Under ordinary circumstances and without the use of strong reflectors, it will take no less than 30 days to notice any change in the lightness of an oil exposed to light, and three times as much for an oil to become colorless. Still, there will always be a yellowish hue impossible to eliminate by the direct action of Solar light without intensifying it by the use of reflectors.

A German chemist who has made a considerable study of the question of utilizing Solar Light for bleaching Linseed Oil, suggests the following method, which he says will give better results in lightness and body than the Sulphurous Acid process or the Sulphuric Acid process.

The bleaching action is many times increased by the use of powerful reflectors which intensify the solar light, multiplying it and conveying it over a large surface of oil protected by a glass, or a large sky light.

The reservoir of Linseed Oil in this case should be only one foot deep and present to the action of light as large a surface as possible. The bottom of the reservoir could also be reflector of light, thus increasing the bleaching considerably.

PART No. IX

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF BLEACHING OR REFINING

VARNISH GUMS OR RESINS.

Part No. IX.

QUESTIONS OF BLEACHING OR REFINING VARNISH GUMS AND RESINS.

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S H E L L A C   B L E A C H I N G .

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#900. Theoretically, the bleaching of Shellac is a simple operation which requires only a good understanding of the peculiar nature and characteristics of this gum resin, and some knowledge of a few elementary principles of applied chemistry. But when it is a question of producing regularly large quantities of BLEACHED SHELLAC at a time with a view to supply the market with a manufactured product fully up to the highest standard of excellence in QUALITY, WHITENESS, HARDNESS and SOLUBILITY, the question then is far from being simple as it first appears; a complicated organization becomes necessary; every detail of the operation must be conducted slowly and with special care. Furthermore, it requires considerable experience to insure uniformity in the finished product.

The object of bleaching Shellac is to remove entirely by a chemical treatment, the coloring substance produced by the insect and contained in the raw material used under the name of BUTTON LAC so as to get as a result a gum resin capable of producing with the proper solvent a COLORLESS SHELLAC VARNISH; but this is not the only result aimed at. In removing from the BUTTON LAC the coloring principle, several other organic and soft substances of animal origin are also eliminated either chemically or mechanically, which

contributes to insure the maximum of hardness in the bleached Shellac or finished product.

In bleaching Shellac, the operator must not lose sight of the fact that a faultless Shellac Varnish can be made only from a faultless bleached Shellac.

The maximum degree of WHITENESS, HARDNESS and SOLUBILITY are the three requirements of a faultless White Shellac. The last of these three requirements, the MAXIMUM OF SOLUBILITY (without residue) IN ALCOHOL, has a great importance; and this can be obtained only through a process of precipitating the Bleached Shellac from its alkaline solution by the use of an acid capable of neutralizing the solution without precipitating in the meantime an INSOLUBLE SALT OF LIME.

#910. Various samples of the finest grades of WHITE SHELLAC, made in Europe, directly imported from England, France and Germany, were first submitted by the writer to a chemical analysis; then comparatively tested as to their working properties, behavior in alcohol, whiteness and hardness. The result is certainly interesting enough to practical Varnish makers to be briefly mentioned.

For WHITENESS, RESISTANCE TO THE ACTION OF AIR, and also for DISSOLVING POWER, the French bleached Shellac has never been equaled by either the German or the English product.

Hanks of French bleached Shellac have stood a temperature

of 85 to 90 deg. F. without showing any tendency to soften or become tacky.

As far as HARDNESS only is concerned, the English bleached Shellac is superior to the French; but when we take in consideration that the English Shellac is precipitated from solutions of Hypochlorites of Soda or Potash by Sulphuric Acid, we must give the preference to the French product, which although not so hard as the English, presents the advantage of being soluble much more readily in alcohol and special menstruums.

In the experiments which I have made, the German product like the French, was found entirely free from Sulphate of Lime and therefore soluble without residue in alcohol, which seems to indicate that the process of precipitating shellac from alkaline solutions is the same in Germany and France, DILUTED MURIATIC ACID being used in both countries in preference to SULPHURIC ACID, as it is the case in England generally.

Hanks of Shellac representing various samples of domestic origin were also compared to the FRENCH, the ENGLISH and the GERMAN IMPORTED PRODUCTS. The German process seems to have been adopted successfully in the United States. There are, however, imperfections in the various samples of American Bleached Shellac which I have examined, that do not exist in the German or the French product; namely:

1st. ITS SENSITIVENESS TO THE ACTION OF LIGHT, WHICH

MAKES IT TURN YELLOW AFTER TWO OR THREE WEEKS EXPOSURE.

2nd. ITS TENDENCY TO SOFTEN IN THE SUMMER AND BECOME ADHESIVE TO THE BARREL IN WHICH THE HANKS HAVE BEEN PACKED.

American Bleached Shellac, freshly made, is fully as white as the French; the difference becomes noticeable only after a couple of weeks of exposure, when it can be seen that the latter remains almost unchanged while the former has turned yellowish in color.

Furthermore, there is a finish in the texture and the general aspect of the French Bleached Shellac which denotes a superior care or skill in carrying out all the various phases of the manipulation.

In the manufacture of a faultless bleached Shellac, there are several operations entirely of a mechanical nature which exert a considerable influence upon the aspect, the whiteness and the texture of the finished product. These operations, which are the result of experience, constitute the secret of producing an article fulfilling all the requirements of the Varnish maker who uses bleached Shellac as a raw material in the same way as he uses other rosin gums for manufacturing Varnishes.

We give hereafter a general description of all the various phases of the operation for preparing from BUTTON LAC the commercial product known under the name of WHITE SHELLAC.

GENERAL DESCRIPTION OF THE PROCESS

FOR

THE MANUFACTURE OF BLEACHED SHELLAC.

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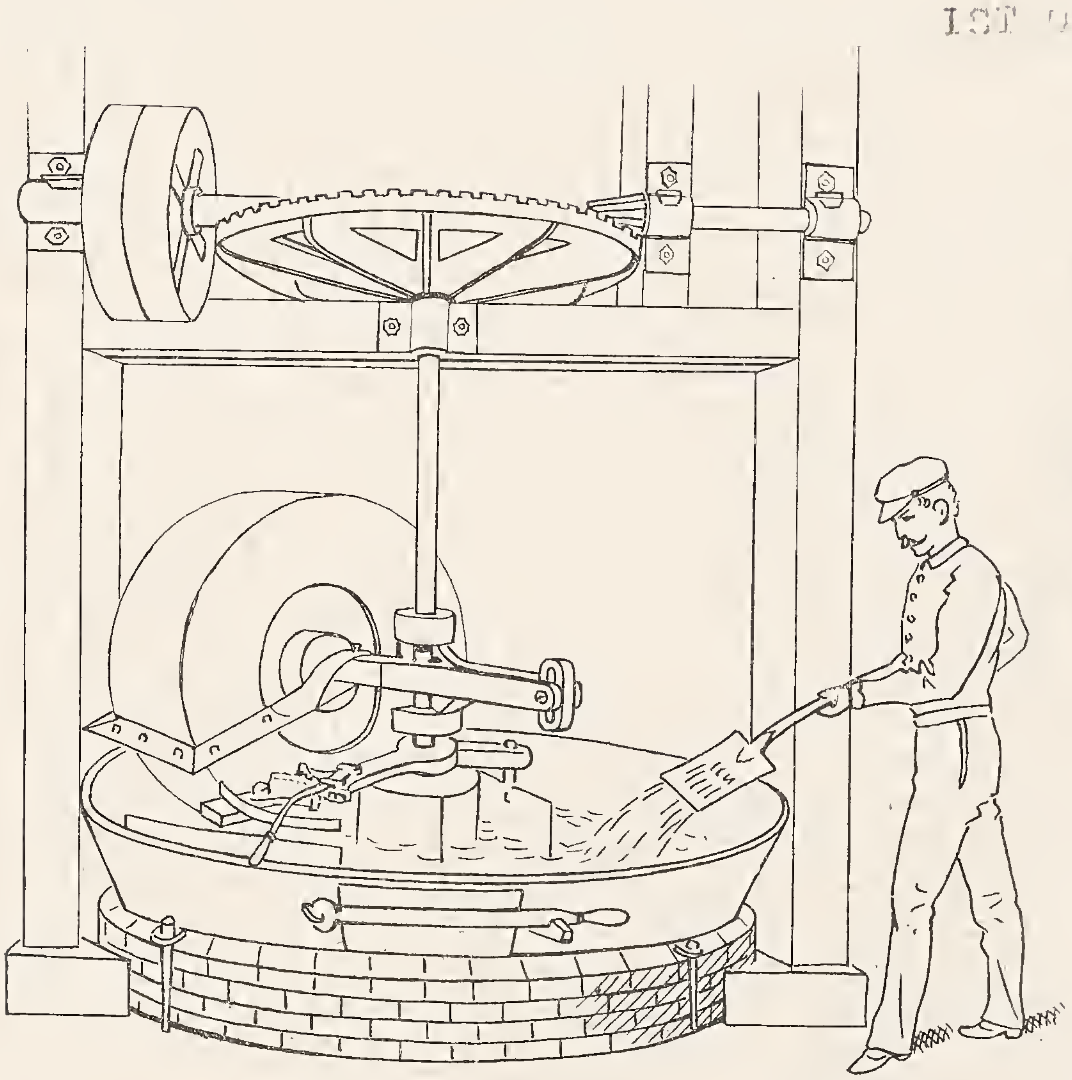
925. The process of bleaching Shellac can be divided into 12 different operations:

1ST OPERATION:



CRUSHING THE RAW MATERIAL OF BUTTON LAC SO AS TO REDUCE IT TO A POWDER MORE EASILY SOLUBLE IN THE ALKALINE SOLUTION.

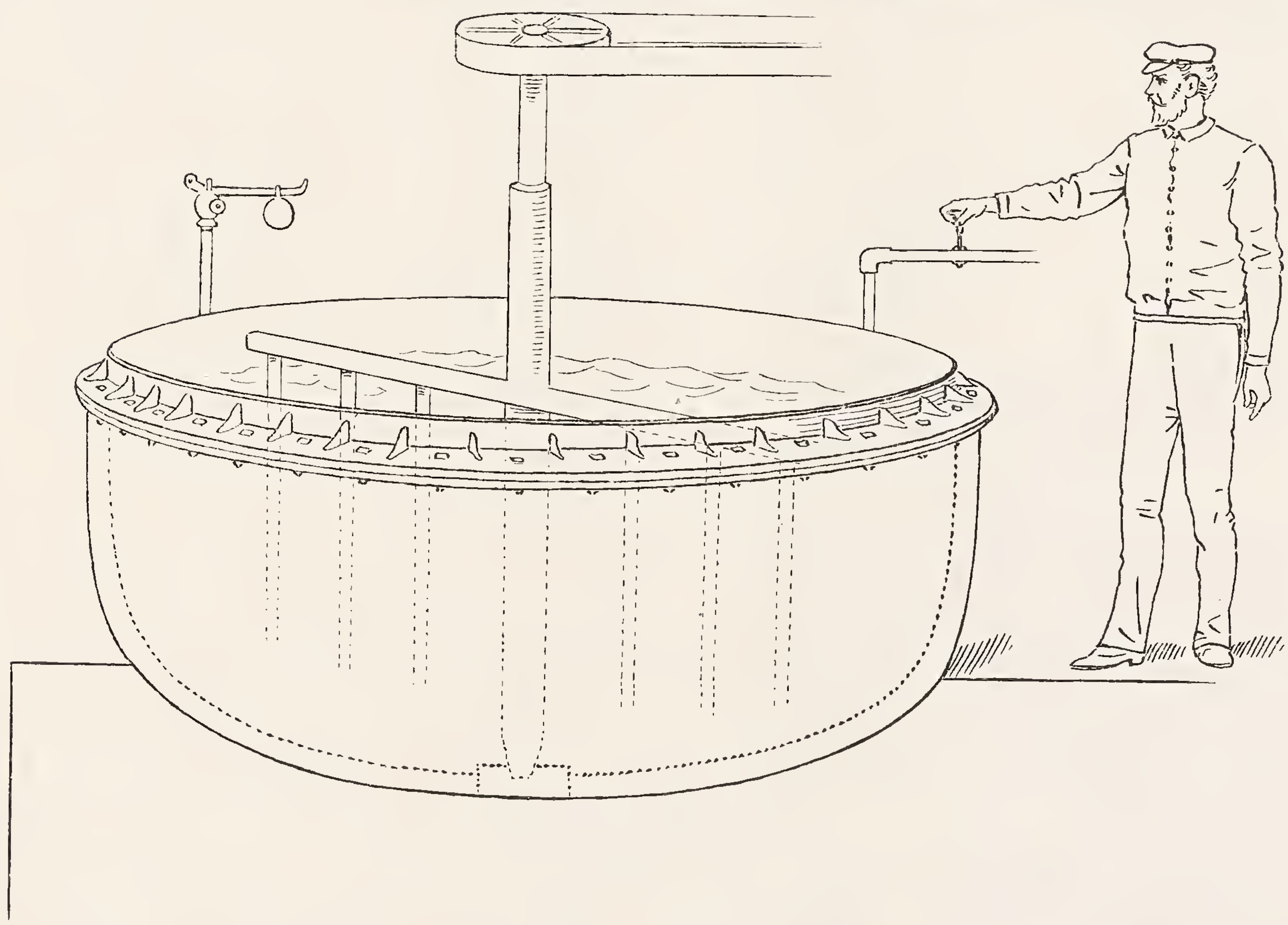
In a chaser such as the one described as per cut, a large quantity of Button Lac could be crushed at a time and kept in stock for future use. But experience demonstrates that it is far better to crush the BUTTON LAC just at the moment of using it; it is then freshly disintegrated, and much more easily soluble in the alkaline solution. For this reason, it is preferable to have a chaser of large capacity instead of a small crusher.

2ND OPERATION: #930.

SEPARATION OF THE COLORING PRINCIPLE FROM THE GUM RESIN, WHICH IS OBTAINED BY BOILING THE BUTTON LAC IN IRON STEAM JACKETED KETTLE WITH ALKALINE SOLUTION.

In a double bottom or high pressure steam jacketed kettle of about 300 gals. capacity, dissolve in 150 gals. of water:

200 lbs. of CARBONATE OF POTASH.



Turn the steam on; bring to the boiling point, and when the solution is complete, add:

200 lbs. COMMON SALT SODA.

Keep in ebullition until your solution of Carbonate of Potash and Soda is complete; then from your stock of BUTTON LAC which has been

just crushed as per instructions given in the previous operation, shovel into the kettle gradually,

600 lbs. of BUTTON LAC,

after having put in motion the mixer. Let the mixer run for about a couple of hours, and have the steam heat just enough to keep the mixture boiling gently.

After two hours, stop the mixer; turn off the steam; fill the iron kettle with cold water to the top and allow the preparation to rest undisturbed for an hour or so.

It can then be noticed that all the brown reddish coloring substance which comes from the insect which has been dissolved by the ALKALINE SOLUTION and the RESIN LAC separated from it, rises to the surface, where it gradually forms a thick layer.

One hour after, the RESIN LAC can be collected from the surface of the ALKALINE WATER, while the coloring substance in solution in the alkaline water is sent to a large vat where it is kept in stock for future treatment.

The RESIN LAC, after having been removed from the iron kettle, is sent to a large vat of about 2000 gals. capacity, where the BLEACHING PROCESS will take place as hereafter described.

When large quantities of Shellac have to be bleached in one day, it is then necessary to have 5, 10 or 20 large vats of 2000 gals. capacity, and more than one steam jacketed kettle.

3RD OPERATION: 1940.

PREPARATION OF THE BLEACHING AGENT OR HYPOCHLORITE OF POTASH OR SOD

In a 150 gal. vat (No. 3) dissolve:

200 lbs. of CARBONATE OF POTASH OR SODA,

using about 50 gallons of hot water.

In another vat (No.2) of about 150 gallons, dissolve under constant stirring and using cold water,

200 lbs. of HYPOCHLORITE OF LIME, commonly named "Bleaching Powder"; and fill the 150 gal. vat (No. 2) up to top with cold water.

Do the same in vat No. 3; fill it to top with cold water. When these two solutions are sufficiently cold, they must be sent from their respective vats into a large vat of 2000 gals. placed underneath, the HYPOCHLORITE OF LIME SOLUTION first, and the CARBONATE OF POTASH OF LIME SOLUTION immediately after.

As a result of the chemical reaction which takes place when the two solutions are sent into the large vat, there is a production of HYPOCHLORITE OF POTASH OR SODA (soluble) and the precipitation of a certain amount of CARBONATE OF LIME (insoluble), which settles at the bottom.

the HYPOCHLORITE OF POTASH OF SODA thus produced is kept in stock for use in BLEACHING Shellac when needed.

4TH OPERATION: #950.

TREATMENT OF THE LIQUIFIED BUTTON LAC BY THE BLEACHING AGENT

The liquified Resin Lac having been separated from the coloring substance in the iron kettle as it has been described in Operation No. 2, and the thick layer of Button Lac having been removed from the iron kettle as already said, is now placed in another 2000 gal. wooden vat No. 5, where the Resin Lac will be submitted to the bleaching action of the Hypochlorite of Soda or Potash already mad .

It must be remembered that in producing the HYPOCHLORITE OF SODA OR POTASH (soluble) we have also produced, chemically, a certain quantity of CARBONATE OF LIME, which by this time must have settled at the bottom of the vat where we keep in stock the Bleaching agent of HYPOCHLORITE OF POTASH OR SODA SOLUTION.

Now in using this solution, the operator must be careful in not using also some of the residue of CARBONATE OF LIME, which

would be found afterwards in the state of impurity in the Shellac.

The faucet of the HYPOCHLORITE OF POTASH OR SODA SOLUTION vat should for this reason be placed at about two inches above the bottom so as to allow space under it for the sediment or residue of CARBONATE OF LIME. These precautions having been taken, open the faucet of vat and let about 800 gals. of HYPOCHLORITE OF POTASH OR SODA run in the vat where is already placed the liquified Resin Lac collected from the steam jacketed kettle at the end of the first operation.

Stir the resin Lac into the solution of HYPOCHLORITES.

At this stage of the operation, the bleaching action commences and the Resin Lac dissolves gradually in the HYPOCHLORITE OF POTASH OR SODA, which contains alkali in excess. Keep the preparation under constant stirring until the resin Lac has been entirely dissolved; then allow to rest until the day after.

The day after, all the Resin Lac will have been dissolved and bleached at the same time by the HYPOCHLORITE OF POTASH OR SODA, the liquor being then as clear as water.

5TH OPERATION: #955.

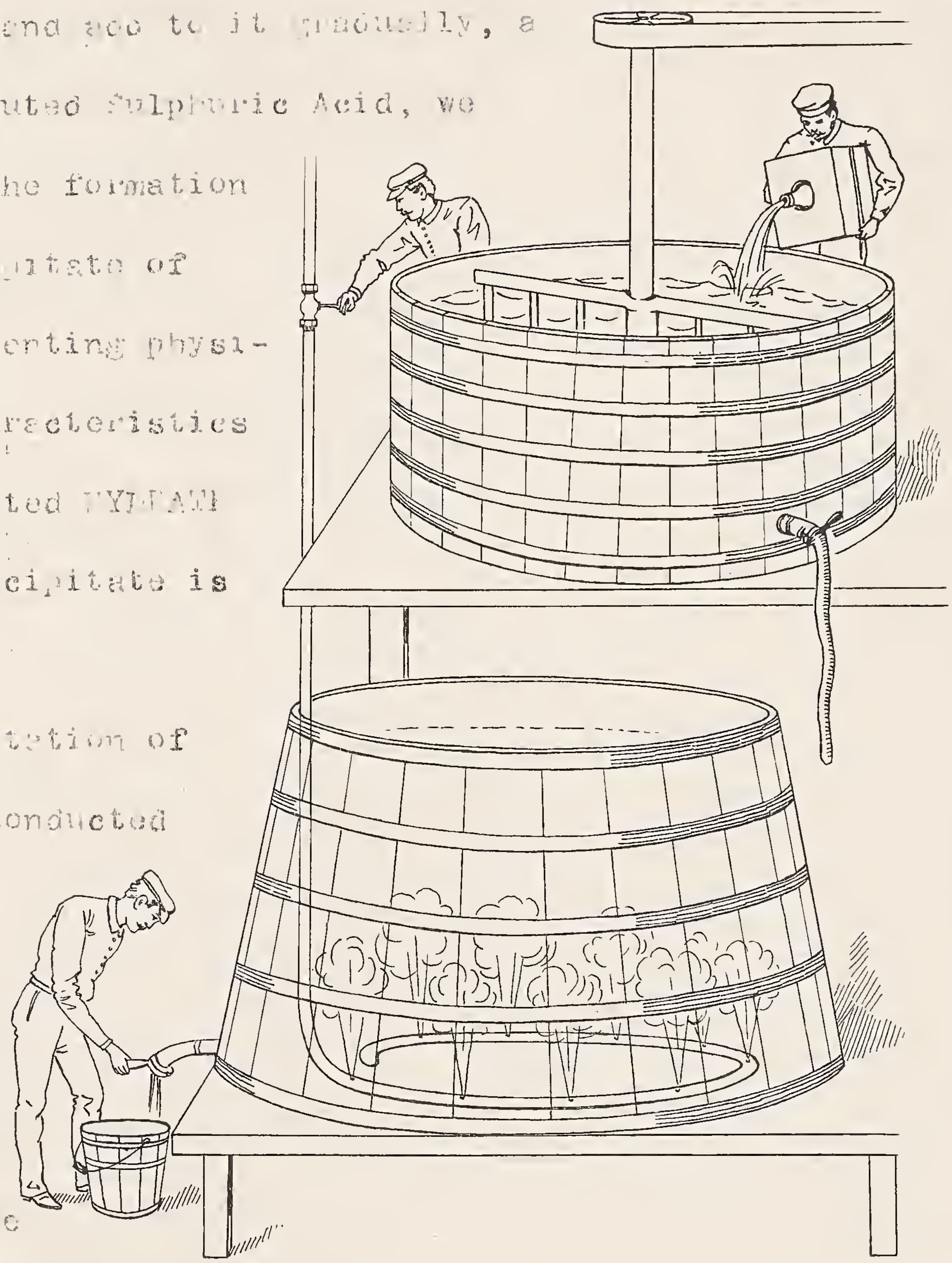
DILUTING THE BLEACHED SHELLAC ALKALINE SOLUTION IN TWICE THE AMOUNT OF WATER.

Fill the vat with clear water up to the top.

6TH OPERATION: #960.

PREPARING THE SULPHURIC ACID FOR NEUTRALIZING THE ALKALINE SOLUTION OF SHELLAC.

If we take a sample of the Shellac solution from the vat in a glass graduate, and add to it gradually, a little at a time, diluted Sulphuric Acid, we will notice at once the formation of a voluminous precipitate of flaky appearance presenting physically some of the characteristics of recently precipitated HYDRATE OF ALUMINA. This precipitate is the White Shellac.



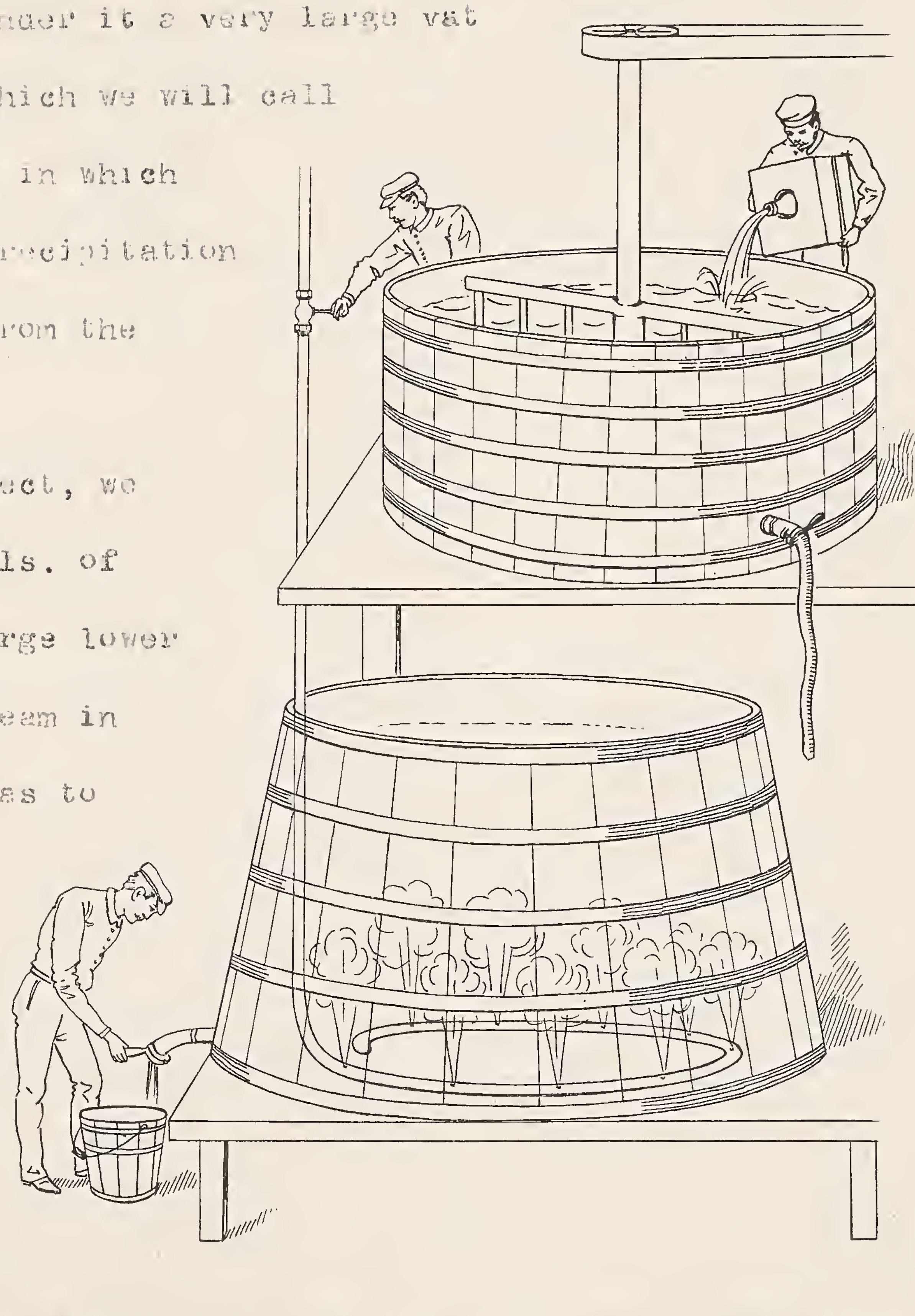
The precipitation of the Shellac must be conducted as per instructions given in operation No. 7. But before describing this operation, we must prepare the Sulphuric Acid solution.

COMMERCIAL SULPHURIC ACID 66 deg. cannot be used without diluting it to a great extent; a weak solution is then made thus:

In a 300 gal. cedar vat, 3 carboys of Sulphuric Acid

66 deg. are diluted in 250 gals. of cold water; the mixture first develops a high temperature. Let the solution cool down before using, and keep this diluted Sulphuric Acid for use when needed.

The Sulphuric Acid solution should be placed in an upper vat as per cut, and under it a very large vat of about 300 gals., which we will call the STRIKING VAT, and in which will take place the precipitation of bleached Shellac from the alkaline solution.

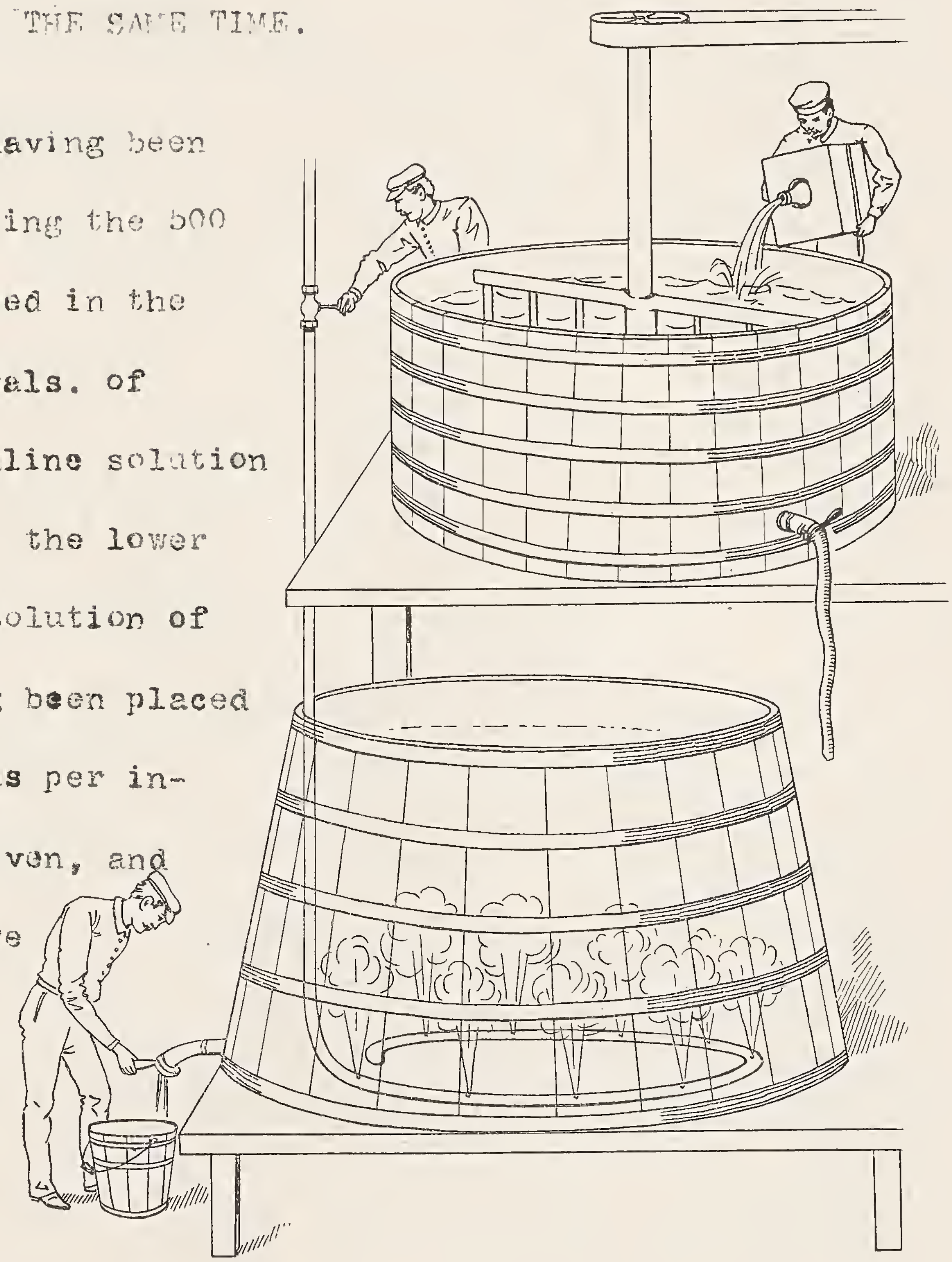


To this effect, we must first put 500 gals. of clear water in the large lower vat, then turn the steam in it, as described, so as to bring these 500 gals. of water to the BOILING POINT.

This being done, turn off the steam and carry about 1000 gals. of bleached Shellac alkaline solution into the 500 gals. of boiled water already placed in the lower vat.

7TH OPERATION:

#965. NEUTRALIZING THE SHELLAC ALKALINE AND CLEAR SOLUTION BY THE USE OF DILUTED SULPHURIC ACID, WHICH PRECIPITATES THE BLEACHED SHELLAC AT THE SAME TIME.



The steam having been turned off after boiling the 500 gallons of water placed in the lower vat, the 1000 gals. of bleached shellac alkaline solution having been sent into the lower vat and the diluted solution of Sulphuric Acid having been placed into the upper vat, as per instructions already given, and exactly as per cut, we will now proceed to the precipitation of the bleached Shellac.

A stream of the Sulphuric Acid solution is then sent through the rubber hose gradually into the striking vat placed underneath. The alkaline solution of WHITE

SHELLAC is gradually neutralized; and as soon as it becomes neutral the bleached Shellac is separated from the solution, forming a flaky precipitate which settles at the bottom.

The diluted SULPHURIC ACID SOLUTION must be added in a light stream gradually and under constant stirring, until the neutralization of the mother liquor is complete, which can be easily ascertained by the LITMUS BLUE PAPER test.

8TH OPERATION: #970.

FILTERING THE PRECIPITATE OR PULP OF WHITE BLEACHED SHELLAC.

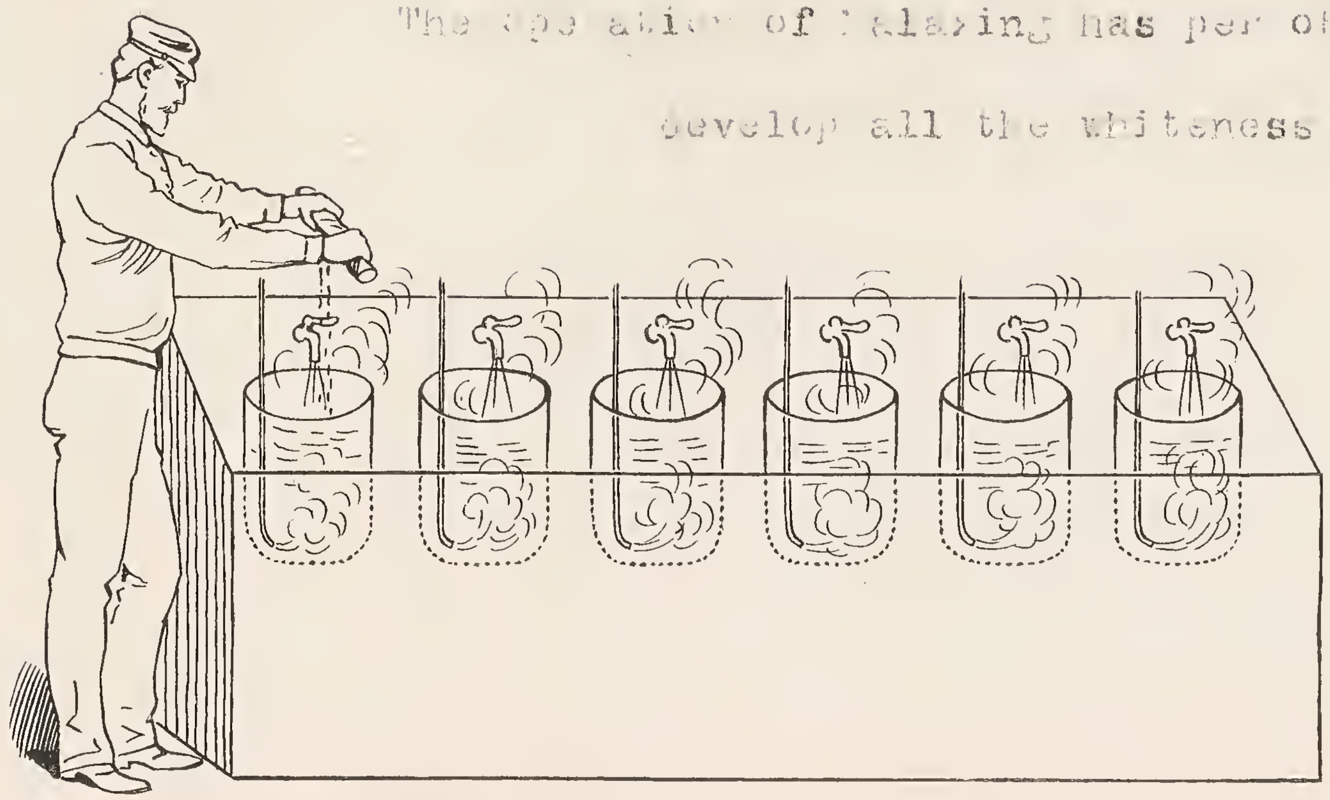
Immediately after all the bleached Shellac which was contained in the alkaline solution has been precipitated by the neutralization of this solution through the use of diluted SULPHURIC ACID, the next thing to do is to allow the precipitate to settle over night. The day after, the supernatant liquid above the sediment is removed through a syphon, and the precipitated pulp of Bleached Shellac is washed several times until perfectly free from acid.

At this moment, it is sent to a filter which separates the liquid from the solid part of the precipitate, leaving over the surface of the filter a stiff paste or pulp of bleached Shellac ready then for the next operation of MALAXING.

" 9TH OPERATION: #975.

MALAXING THE NEUTRAL PULP OF BLEACHED WHITE SHELLAC SO AS TO DEVELOP ALL ITS WHITENESS AND ELASTICITY.

The operation of Malaxing has per object to develop all the whiteness of the



Shellac, and at the same time its elasticity. The pulp of White Shellac, such as it is on the filter, has a gray color; thus gray color can be modified to a great extent and turned into a far more desirable white through the MALAXING PROCESS.

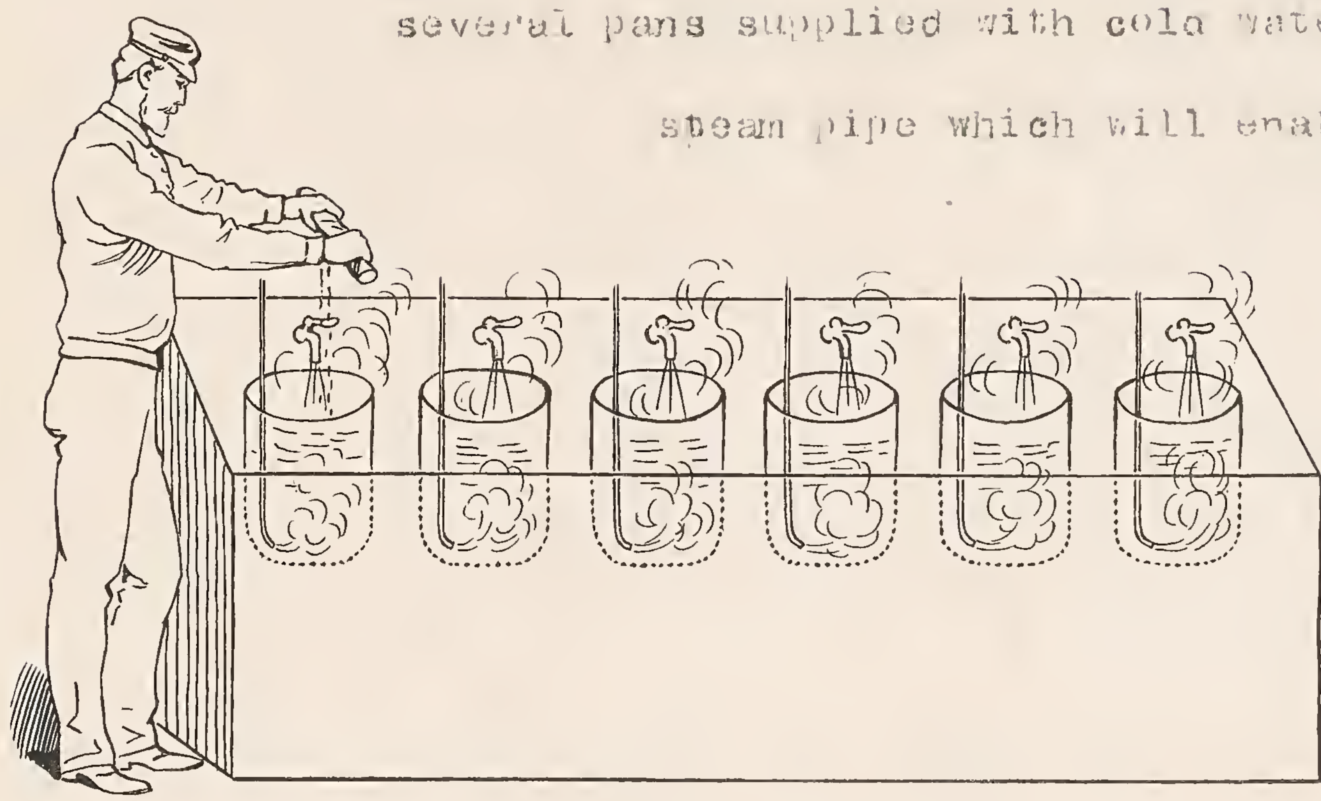
This MALAXING PROCESS consists first in transforming the Shellac pulp into a paste having elasticity and cohesion; this can be obtained easily by simply dipping the Shellac pulp in boiling water.

The effect of the temperature gives cohesion to the Shellac; it can be then kneaded to a paste and when in this state is quickly passed through a roller mill of two cylinders of metal

or wringers.

After passing through the wringer, the Shellac paste is plastic enough to be shaped into HANKS.

This cut represents a table through which are inserted several pans supplied with cold water and open steam pipe which will enable the



operator to bring the water in the pan to the BOILING POINT.

As it has been already said, the pulp of white Shellac is distributed in each pan in lots of about 3 to 5 lbs. The pan is filled with water, the steam turned on and the Shellac pulp then submitted to the action of boiling water, which gives cohesion and plasticity.

Practice only can enable the operator to give a nice appearance to the HANKS OF BLEACHED SHELLAC, which immediately after being shaped must be sent into another vat of cold water and kept there in stock.

Generally HANKS of White Bleached Shellac are kept in a cold water bath until the moment when they must be packed and shipped.

Kept in this way in a large and well covered vat, the HANKS of Bleached Shellac can retain for a long time their original whiteness; but the vat must be well covered so as to keep the HANKS out of light; otherwise, they would turn yellowish in color after a week or two of exposure.

The following operation describes a method for the prevention of HANKS of white Shellac from turning yellow.

10TH OPERATION: #980.

HARDENING AND WHITENING PROCESS OF THE SULPHUROUS ACID BATH, WHICH PREVENTS TO A GREAT EXTENT HANKS OF WHITE SHELLAC FROM BECOMING YELLOW WHEN EXPOSED TO LIGHT.

White bleached Shellac recently made as per process and various operations already described, may be very white in color and the HANKS perfectly hard when taken from the cold water bath for packing and shipping; this will not prevent the change in color already mentioned from taking place; and after a couple of weeks exposure to light, the HANKS OF WHITE SHELLAC will commence to darken or turn yellow.

In summer time, another drawback must be expected which is due to the temperature. When the temperature is above 90 deg.

F., the White Shellac packed in barrels softens like Rosin and becomes so adhesive that the whole contents of the barrel stick together and soon form one mass.

The two drawbacks above referred to can be to a great extent prevented by a very simple operation, which consists in submitting the HANKS of white shellac to the BLEACHING and HARDENING action of DILUTED SULPHUROUS ACID.

There is no extra labor required to accomplish this result; the only thing to be done is to add 2 gals. of Sulphurous Acid (commercial solution) in the large vat when the HANKS of Shellac are kept in stock in cold water. As the vat contains a large quantity of cold water, the solution of SULPHUROUS ACID is very weak, but sufficient to have the desired effect.

The sulphurous acid, which is the most powerful bleaching agent known, acts on the surface of the HANKS of Shellac, destroying the principle which causes the Shellac to turn yellow; while in the meantime it hardens the surface of the Shellac enough to prevent it from becoming SOFT or TACKY when the temperature in summer time rises to 95 deg. F.

The HANKS of White Shellac must remain at least 72 hours in the Sulphurous Acid bath, after which they can be packed in barrels ready for shipment and sent to tropical regions without any danger of turning yellow, softening or sticking to the barrel.

11TH OPERATION: #985.

DRYING THE BLEACHED SHELLAC.

When the bleached Shellac is not to be packed in the shape of HANKS, but coarsely ground, there is another operation to be done before the crushing; this operation is the drying.

A DRYING ROOM for white bleached Shellac must be specially constructed; heat cannot be used; the dampness must be exhausted by a current of cold air which activates the evaporation.

This current of air can be produced mechanically by a fan or exhauster placed in a corner of the drying room at about 6 inches from the ceiling.

On the other side of the drying room and just opposite the exhauster or fan, there must be an opening for the free passage of cold air.

The floor is made of hard wood, perfectly dry, and the bleached Shellac spread on trays, where it is allowed to remain until dry enough to be crushed.

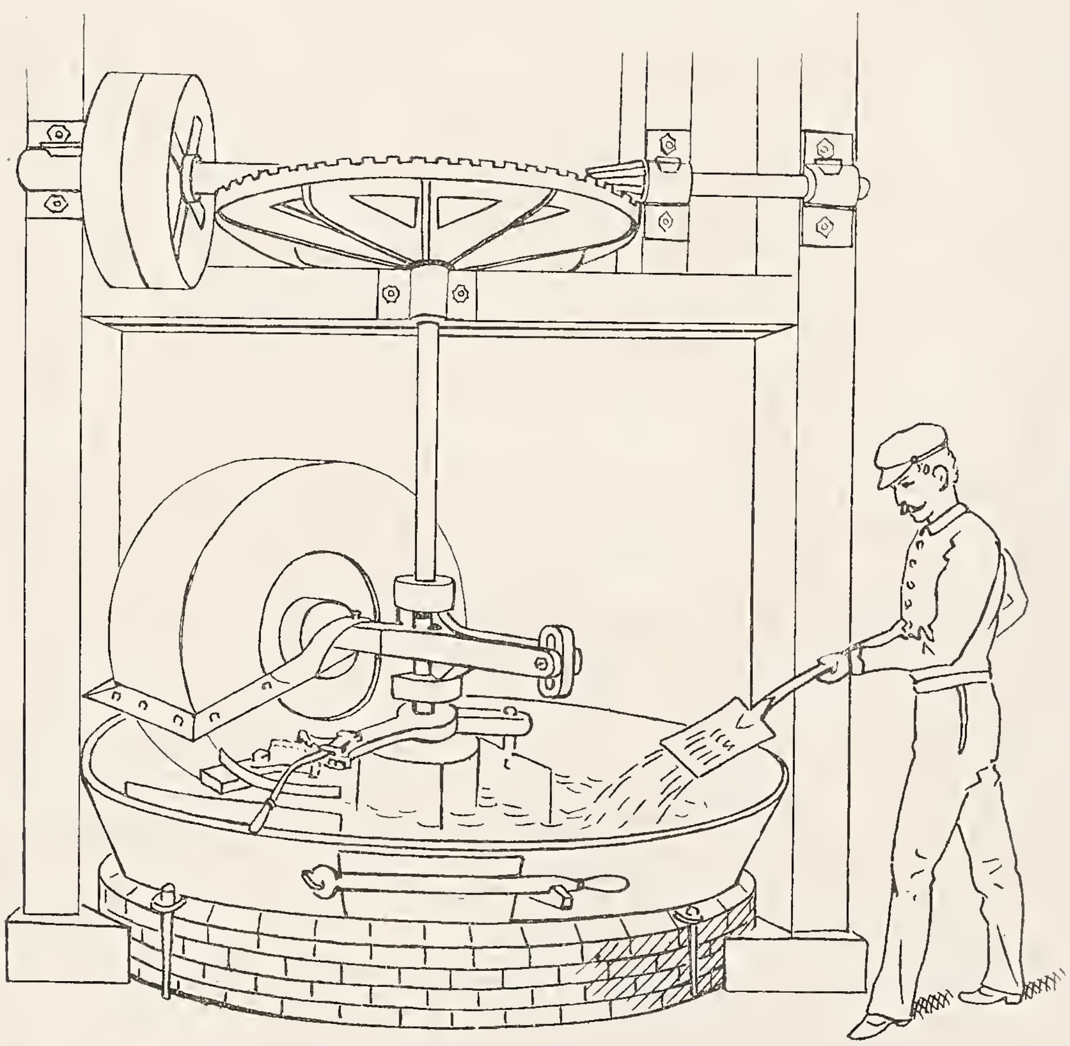
A bleached Shellac which has not been perfectly dried dissolves in alcohol with great difficulty.

Very often the cause of a bleached Shellac not being "taken up" by Wood Alcohol 97 deg., is due entirely to an imperfect elimination of the dampness through the drying process. For this reason, great care should be exercised in drying.

12TH OPERATION: 7990.

CRUSHING THE BLEACHED SHELLAC.

When the white Shellac after having been bleached is not intended to be sold in the shape of HANKS but crushed into a coarse grain, it is then sent directly to the DRYING ROOM immediately after the precipitate has been filtered to the consistency of stiff



pulp. When it is perfectly dry, it is taken out of the DRYING ROOM and crushed through an edge runner or chaser, as the one above. It is not necessary to reduce it to a fine powder; but only to crush it coarsely, like saw-dust.

PART No. X

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS CONCERNING

THE TREATMENT AND HARDENING OF ROSIN.

Part No. X.

QUESTIONS CONCERNING THE TREATMENT AND HARDENING OF ROSIN.

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PRACTICAL HINTS CONCERNING THE USE OF CHEMICALS, INGREDIENTS AND MATERIALS SUSCEPTIBLE OF NEUTRALIZING AND HARDENING ROSIN.

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#1000. Quite a number of chemicals are capable to act upon melted rosin and produce a partial or complete neutralization at a temperature not exceeding 350 deg. F.; but only very few ingredients have been found up to date which really deserve the attention of competent Varnish makers.

The ingredients mostly used are:

1st.	Glycerine.	5th.	Red Lead.
2nd.	Lime.	6th.	Sugar Lead.
3rd.	Sulphate of Zinc (calcined)	7th.	Caustic Soda.
4th.	Alum.	8th.	Ground Glass.

#1010. GLYCERINE should be used in its crude state, and just in the proportion required for producing a resinate of Glycerine, the result of which is a rosin preparation showing no tendency to granulate.

LIME:

#1020. Should be carefully prepared to become adapted for use in treating rosin. There are many brands of Prepared Lime sold, but very few fulfill all the requirements. This material is very easily affected by dampness and atmospheric influences, and promptly loses all its value as a hardening agent of rosin. Therefore, it should always be kept in small sized packages for use as soon as possible after the package has been opened. The Lime should be free from Hydrate and powdered as fine as possible.

PREPARED LIME:

#1030. Under the name of "Prepared Lime" have been placed in the market quite a number of materials with a special claim attached to them as hardening agents for rosin. These materials, with very few exceptions, are not any better than ordinary Lime, although a price two to three times higher is often asked for them.

CALCINED LIME SHELLS:

#1040. Amongst the most valuable preparations of Lime, especially intended for hardening rosin, CALCINED LIME

SHELLS have proven to be the most energetic material known. And as the price is only $1.50 or $2.00 per bbl., this material is extensively used today by Varnish makers for the purpose above specified and according to a method and process which will be at length explained further on.

HYDRO CALCINE:

#1050. This is another lime preparation largely sold for hardening rosin. It is considered to be a high grade of calcined Lime Shells. Magnificent results have been obtained from it by the writer in the special treatment of common rosin intended to be transformed into resinate of Lime for mixing with inferior Kauri so as to produce a low grade of Furniture Varnish, drying rapidly without becoming tacky.

SULPHATE OF ZINC:

#1060. This material, which is also called white vitriol, has been a long time used in Varnish making; but its application to the treatment of rosin only dates from ten years ago. It has effectively a hardening action upon common rosin. But it does not give the same satisfactory result as ordinary Lime or the Lime prepara-

tions already referred to. A rosin which has been hardened to the action of Sulphate of Zinc is more quickly affected by the action of temperature than Resinate of Lime.

ALUM:

#1070. Alum has also a clarifying effect upon rosin, and to a certain extent a somewhat hardening action. A saturated solution of alum is made in boiling water and gradually added to the rosin melted. The water from the solution is evaporated and the chemical combines in the proportion of about 40% with the melted rosin.

RED LEAD:

#1080. Acts not only as a hardening agent, but also as oxidizing. It should be used with a great deal of care in very small proportions, and "COOKED" gradually at a temperature of 350 to 375 deg. F. until the moment when the chemical is all "taken up". Red Lead unquestionably hardens rosin, but turns it very dark.

GROUND GLASS:

#1090. Is the best material for clarifying melted rosin rendered cloudy by the action of Lime Shells.

IMPROVED METHOD AND PROCESS FOR THE SPECIAL TREATMENT OF ROSIN IN THE PRODUCTION OF A SUBSTITUTE FOR HARD GUM AR ARTIFICIAL KAURI GUM. FRENCH ARTIFICIAL KAURI OR HARD ROSIN PREPARATION FOR MIXING WITH COPAL, MIXING WITH SHELLAC, AND CHEAPENING ALL SORTS OF VARNISH MADE FROM HARD GUMS SOLUBLE IN OIL, TURPENTINE OR NAPHTHA.

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#1098. The demand for a Varnish cheaper than it can be made from the use of hard gums or fossil resins, has led quite a number of chemists and practical Varnish makers to find a process by which the cheapest kind of material or the common rosin could be hardened and neutralized so as to mix in any proportion with oil, turpentine or naphtha without separating, granulating or settling. But with the exception of this improved process, there is no advantage except in cheapness to expect from the admixture of common rosin with the ordinary diluents.

The greatest difficulty in producing a rosin preparation is to not only harden it but to prevent it from becoming tacky as soon as the temperature is above 85 deg. F.

A well prepared rosin is a very valuable material for reducing the cost of a Varnish made from hard gums, without affecting its hardness or hard rubbing property.

A well prepared rosin must, after having been thinned down simply with Benzine and applied with the brush in a very thin layer on a wood surface, dry evenly, leaving a fine, smooth and glossy surface entirely free from specks.

The successful treatment of rosin in the manufacture of Varnishes requires not only a thorough knowleoge of the peculiar characteristics of this material, but also a great deal of care is to be exercised in carrying out every phase of the operation of neutralizing.

Were it not for the fact that, after having been applied on a surface and allowed to dry thoroughly, a rosin Varnish made entirely from prepared rosin softens at a temperature of 92 deg. F. and becomes tacky, this material would readily find a number of new applications where the question of cheapness is to be seriously considered.

How to neutralize properly rosin under the most favorable conditions of economy, how to impart the maximum amount of hardness to it so as to prevent it as much as possible from drying tacky, or softening at a temperature of 100 deg. F.? This is what has been attempted by many Varnish makers of large experience, and can be accomplished by the various methods described hereafter.

NEW METHOD, FORMULA, PROCESS AND COMPLETE INSTRUCTIONS FOR MAKING

E X T R A   H A R D   R O S I N .

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#1095. The process can be conducted either in an iron steam jacketed kettle giving a temperature higher than 212 deg. F. (by steam pressure or over-heated steam) or in the ordinary single bottom copper kettle directly heated by a coke fire.

In both cases, the formula of preparation is exactly the same.

FORMULA:

Rosin E - - - -	200 lbs.
Water - - - - - - - - - -	6 gals.
Glycerine (crude) - -	4 ozs.
Caustic Soda - - - - - -	6 lbs.
Sugar Lead - - - - - -	8 "
Hydro Calcine - - - - -	5 "
Ground Glass - - - - - -	1 "

PROCESS:

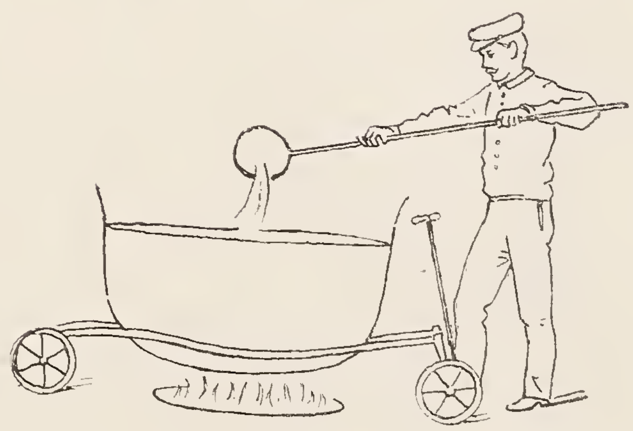
If you use a steam jacketed kettle such as the one above, no special precautions have to be taken as to how to conduct the

heat; and as every other part of the process is exactly the same, we will describe it supposing that there is no steam jacketed kettle ready for the operation but only the ordinary large iron kettle mounted on truck and generally used for oxidizing iron.

PROCESS:

Use an iron kettle of about 300 gals. capacity mounted on truck, and proceed as follows:

1st. Melt in your iron kettle 200 lbs. of ROSIN L. Should you desire to get a whiter result, then use rosin of a



better grade. Should you desire to get the finest result that can be obtained as far as color is concerned, take water white rosin.

2nd. When perfectly fluid, draw your kettle three to four feet from the fire place. This being done, have a small 10 gal. kettle or an ordinary copper pail of the same capacity; put in it 6 gals. of water and bring your pail or small kettle over the fire place until the water is boiling. When the boiling point is attained, put in the pail 4 ozs. of CRUDE GLYCERINE.

3rd. When the Glycerine has been thoroughly diluted in water, add to the preparation which is already in the pail and on fire, 6 lbs. of CAUSTIC SODA and dissolve under constant stirring.

4th. The Caustic Soda having been thoroughly dissolved, add to the preparation already in the pail 6 lbs. of SUGAR LEAD. You could use either white or brown sugar lead indistinctly, the result chemically being the same. The Sugar Lead dissolves gradually in the alkaline solution.

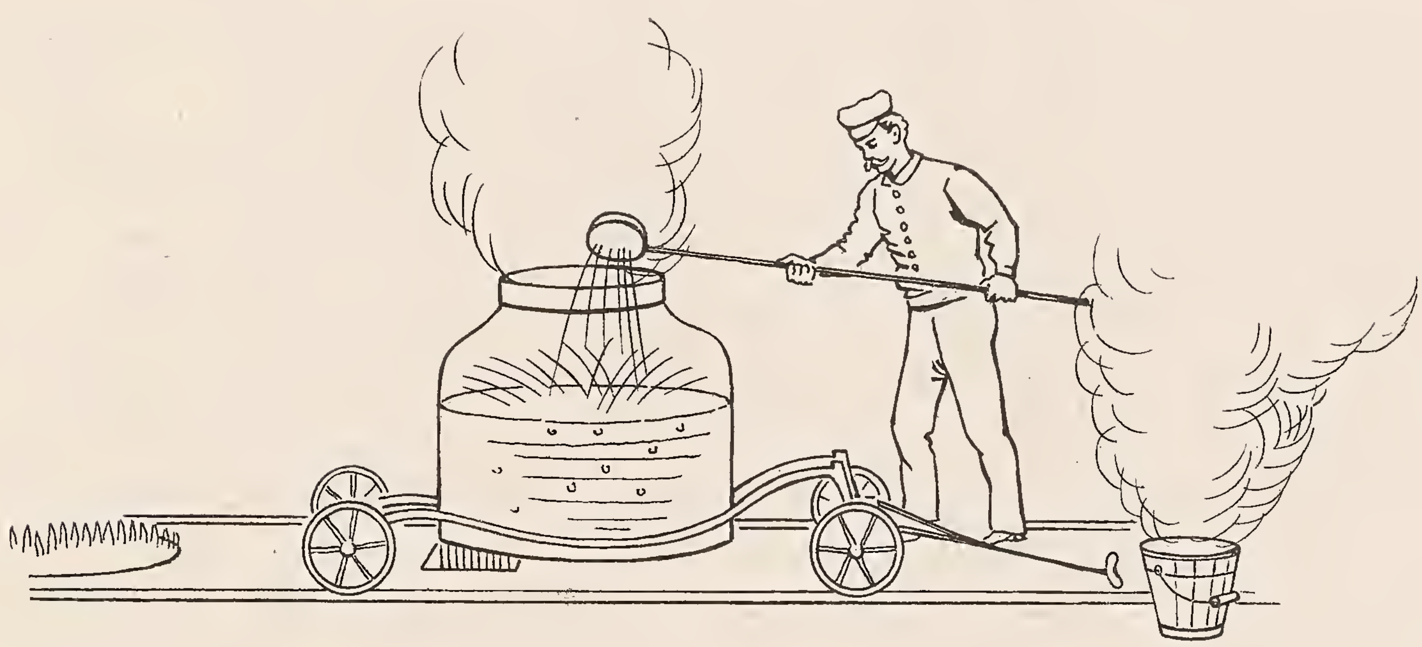
While the Sugar Lead dissolves it is decomposed by the Caustic Soda; there is a production of Acetate of Soda soluble, and precipitation at the bottom of the pail of a flaky white substance which is nothing but a chemically pure "OXIDE OF LEAD" in the highest possible degree of atomic division.

The "OXIDE OF LEAD" thus obtained possesses to a far greater extent than any other Oxide of Lead, such as LITHARGE or RED LEAD, the property of OXIDIZING AND HARDENING ROSIN, while the glycerine will act in the meantime as the neutralizing agent, thus forming a RESINATE OF LEAD and GLYCERINE.

There is not any chemical or combination of chemicals known up to date which will act upon rosin more effectively as hardening agent than the preparation in the pail now, which is to be moved and carried over into the large kettle as follows:

5th. The chemical preparation having been completed, the pail is removed from the fire place and allowed to cool for about five minutes, while the melted rosin from the large kettle is also cooling.

6th. The kettle of melted rosin must be left out of the fire until the moment when the chemical solution and preparation in the pail have been gradually added to the melted rosin VERY LITTLE AT A TIME. Be careful to put the solution in the melted rosin



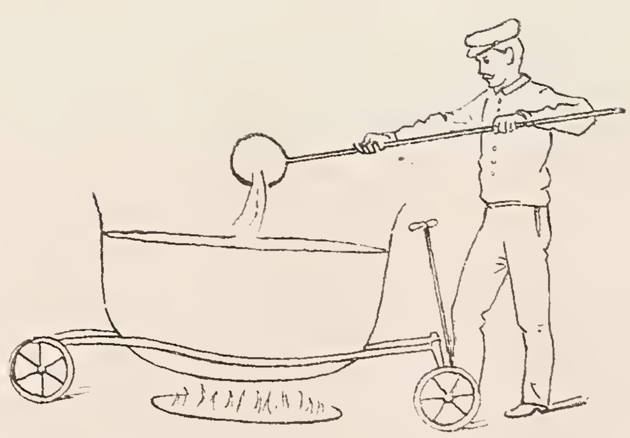
very slowly, using the scoop provided with a long handle as per cut.

7th. As soon as the chemical preparation comes in contact with the melted rosin, there is a strong effervescence immediately produced the surface rising quickly. You must be ready with an iron stirrer to subdue the froth as soon as it is produced.

8th. Immediately after the contents of the pail have

been added to the kettle of melted rosin, replace this kettle on fire and cook until the 6 gals. of water used for dissolving the chemicals are expelled from the rosin by evaporation through heat. This will not take more than 20 minutes; and the proper moment can be easily ascertained from the fact that large bubbles will no longer appear on the surface of the melted rosin as soon as the water will be completely evaporated.

9th. At this stage of the operation, the prepared rosin assumes the aspect of Linseed Oil, simmering gently; the OXIDE OF

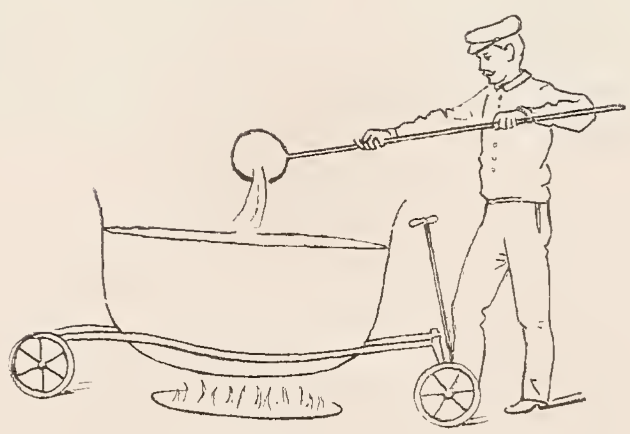


LEAD is gradually "taken up" by the rosin, and the preparation gradually clarifies and assumes the transparency of clear water.

10th. Leave the preparation on fire and let it boil gently fifteen minutes longer.

11th. Now you must have already weighed your 5 lbs. of HYDRO CALCINE. This Hydro Calcine cannot be put into the preparation of rosin with a scoop, as it would form lumps or agglomerations

of Lime which would settle at the bottom of the kettle without being "taken up" by the melted rosin; it must be spread over the whole surface of the melted rosin with a No. 40 Metallic Sieve so as to put only a very small quantity of the Lime preparation in contact with the liquified rosin. The small particles of Lime are in this manner dissolved or "taken up" instantly, providing that the preparation be kept under constant stirring. After all the Hydro Calcine has been added, the preparation ceases to be clear and transparent as it was before. The Hydro Calcine makes it turn cloudy. Leave the kettle on fire about 20 minutes longer.



12th. Have now already weighed 1 lb. of GROUND GLASS and mix it with the rosin preparation under constant stirring and exactly in the same way as it has been done with a sieve for adding the Hydro Calcine. The Ground Glass will gradually settle to the bottom, precipitating all the impurities and thus clarifying the preparation.

13th. Ten minutes after remaining on fire, draw the kettle slowly about 3 feet from the furnace, being careful not to stir the

preparation. The ground glass continues settling, carrying to the bottom, as it has been already said, the particles of lime and impurities which were kept in suspension.

14th. As soon as the preparation has been clarified and all the inert substances settle at the bottom, which does not take over fifteen minutes, the preparation may be considered as completed. The rosin is then quickly neutralized and hardened.

15th. Remove it quickly from the kettle and put it in barrels or kettles or any other suitable package where it will solidify in cooling. Keep this material in stock for use when needed; it is the hardest rosin which can be prepared.

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PART No. XI

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF MELTING AND BLENDING VARNISH GUMS.

Part No. XI.

QUESTIONS OF MELTING AND BLENDING VARNISH GUMS.

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QUESTIONS
OF
MELTING VARNISH GUMS.

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#1100. The "MELTING POINT" of a Varnish gum is the degree of heat or temperature required for bringing this gum to a fluid state; for instance, the "Melting Point" of ZANZIBAR GUM, extra pale, is 482 deg. F.

"MELTING POINT" is the term generally adopted in Varnish factories. "POINT OF FUSION" is a more technical word for it, but means exactly the same.

After a gum has been melted, if the temperature is not raised above the POINT OF FUSION, the Varnish gum remains in a fluid state, the dampness first being expelled by evaporation; then the resinous matters which are volatil are also expelled, producing heavy, dense fumes. In large works, these fumes are drawn through pipes by means of a fan into condensers, where they produce a thick oil.

This oil has the appearance of Varnish; it has a strong, sickly smell and will not dry under any circumstances. It is known in England under the name of "STRONG OIL" or "VAPOR FUMES".

Large quantities are sold for making blacking, also for the manufacture of Lamp Black.

#1110. In melting Varnish gums, it is a question of great importance to keep the temperature not more than 25 deg. above the POINT OF FUSION, this being sufficient to bring the whole mass of the gum to a perfectly fluid state, providing that the iron stirrer be used through the cover so as to facilitate the melting.

A temperature of 25 deg. above the POINT OF FUSION of a Varnish Gum is amply sufficient to eliminate by evaporation all the dampness and resinous matters or empyreumatic essences of the Varnish Gum.

When the POINT OF FUSION of a Varnish gum has been determined once for all, the practical Varnish maker must always bear in mind that it is an absolute requirement not to bring a melted gum to its BOILING POINT, as the secret of a good wear, transparency and flowing depends greatly upon the manner in which the melting of a Varnish gum has been conducted.

Nine-tenths of the Fat Varnishes, even those which have to be kept on fire for a certain time until the prepared oil and the melted varnish gum be thoroughly incorporated together through what is called "Cooking", must not be heated 25 deg. above the POINT OF FUSION of the gum; and when a "PROLONGED "COOKING" of the oil and gum is necessary to bring about the desired result, then

the "COOKING" must be strictly kept at a temperature ranging between the POINT OF FUSION of the gum and its BOILING POINT, without ever reaching the latter.

In fact, a "BATCH" of fine Varnish must be considered as being spoiled when the temperature at any stage of the operation has been brought to or above the BOILING POINT of the Varnish gum used. For instance: the POINT OF FUSION of EXTRA PALE ZANZIBAR GUM being 482 deg. F., and the BOILING POINT of the same gum being 496 deg. F., in order to get the best possible results from a "BATCH" of Zanzibar Wearing Body Varnish, it will be absolutely necessary to manage the preparation of the Varnish so as to keep the temperature not under 482 deg. F. and not above 495 after the Prepared Oil has been added to the melted gum and the "COOKING" of the two properly started.

WHAT IS MEANT BY THE "BOILING POINT" OF A GUM.

#1120. After the Varnish Gum has been heated above its POINT OF FUSION and is therefore completely melted, it has like any liquid a "BOILING POINT", which in some instances requires but very little over-heating to reach.

In the example already given of extra pale Zanzibar Gum, when the temperature of 496 deg. F. has been reached, some bubbles of very small dimensions are then produced; they are hardly noticeable at 496 deg. F., but they become larger and larger while the

heat increases, and at 632 deg. the whole mass is boiling and producing bubbles of about twice the size of those which are produced by boiling water.

From the standpoint of practical Varnish making, it is a great mistake to boil a Varnish gum or to heat it to the BOILING POINT after it has been fused. A Varnish gum which has been heated to the BOILING POINT loses a great deal of its elasticity, has less affinity for Linseed Oil, and becomes one of the chief causes that makes a Varnish "CRACK". Furthermore, a great deal of the FLOWING is destroyed, and the Varnish works hard under the brush.

ABOUT THE BURNING OF THE FLASHING POINT OF A VARNISH GUM:

"1130. After a gum has been melted, then heated at a temperature above its POINT OF FUSION and the heat kept increasing until the moment when the liquified gum is boiled hard, it becomes dangerous then to continue the overheating of the Varnish, as the Varnish gum itself begins to distillate and the products of distillation are inflammable to a high degree and may produce an explosion.

The BURNING POINT OF A MELTED VARNISH GUM should not be confounded with its FLASHING POINT. A gum may burn before reaching its POINT OF FUSION. For instance, when the iron stirrer is not kept constantly in motion so as to "START PROPERLY THE MELTING", the whole mass of the Varnish gum in contact with the bottom of the kettle may burn before the upper part be melted.

ADVANTAGES AND DRAWBACKS TO BE EXPECTED FROM MIXING VARIOUS KINDS OF VARNISH GUMS, AND MELTING THEM TOGETHER IN THE VARNISH KETTLE.

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GUMS WHICH "WORK" AND THOSE WHICH "DO NOT WORK" TOGETHER.

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#1140. When a "BATCH" of melted gum is in the Varnish kettle on fire and another gum or resin gum is added to it so as to melt with it; in other words, when various sorts of Varnish gums are melted together with a special result in view, one of the following results may take place.

I (The two or three different gums may melt together without producing any reaction contrary to the result aimed at, and become so thoroughly and intimately incorporated together as to produce by their association a new gum possessing a new character and presenting peculiar features that the original gums considered separately had not.

The above is one of the rare cases when from 3 various sorts of a gum a Varnish could be made better for certain purposes than it could be produced from the best grade gum of the 3 above mentioned, should & be used alone; but it is not only from the

behavior of 3 different gums melted together in the kettle that the final result can be seen, as the various Varnish gums after being perfectly melted and strongly united together on fire may, after cooling and after thinning down, show a tendency to separate.

#1142. When 3 or more Varnish gums of different nature are placed in the Varnish kettle, then melted together on fire, and form by their association a fluid gum which presents a uniform density, then it may be said that these gums are all soluble in each other's elements. For instance, if we weighed separately:

25	POUNDS	ZANZIBAR PALE	A.
25	"	BENGUELA	B.
25	"	ANGOLA	A.
25	"	SIERRA LEONE	#2,

then placed all these various gum resins into the Varnish kettle and melted them together, the ANGOLA would melt first, then the ZANZIBAR, immediately after the BENGUELA, and finally the SIERRA LEONE.

When all the gums will have been melted together and brought to a perfectly fluid state, the whole mass of the preparation will look perfectly homogeneous; the Aerometer Beaume will show a degree corresponding to a specific gravity of 1075, and no

chemical action or reaction will be produced by these melted gums associated together.

If we remove the kettle from fire and carry it to the thinning room, then thin down the whole preparation with either Turpentine or Benzine, the result will be identical to what would have been the thinning down of any component gum, melted separately; we will then have made a Turpentine or a Benzine Varnish which will "keep" without separating, for the simple reason that ZANZIBAR, BENGUELA, ANGOLA and SIERRA LEONE are all soluble in each other's elements, and also soluble in Naphtha or Turpentine.

Now if we repeat the same preparation in the following manner, and place in the Varnish kettle:

25	POUNDS	ZANZIBAR PALE	A.
25	"	BENGUELA	B.
25	"	ANGOLA	A.
25	"	SIERRA LEONE	#2.
25	"	W. W. ROSIN.	

Then melt all these various gum resins in the Varnish kettle together, the Rosin will melt first; then the Angola; then the Zanzibar; immediately after the Benguela; and finally the Sierra Leone.

#11.4. In this preparation, as in the previous one, when all the gums and resins will have been melted together, the whole will form a fluid showing a specific gravity perfectly uniform when tested with the Aerometer Beaume, no chemical reaction being produced nor sediment generated.

Consequently, W. W. ROSIN is soluble in melted ZANZIBAR, melted BENGUELA, melted ANGOLA and melted SIERRA LEONE.

If we remove the kettle from fire, carry it out to the thinning room, then thin down the whole preparation with either Turpentine or Naphtha, no difference AT FIRST will be noticed between this result and the one mentioned in the previous preparation. We will have made either a Turpentine or a Benzine Copal Varnish containing about 12 1/2 per cent of rosin.

But if we watch now the preparation, we will notice that it will not "keep", and that after standing a certain time there is one of the 5 elements which separates. This element, after due examination, proves to be the fifth one, or the rosin; it granulates and slowly separates from the other four gums, while these remain as heretofore, strongly united, without showing any tendency to settle or separate.

Consequently, it may be said that:

IF ROSIN IS SOLUBLE IN ALL THE ELEMENTS OF ZANZIBAR, ANGOLA, BENGUELA and SIERRA LEONE GUMS, IT CEASES TO BE SOLUBLE IN A SOLVENT OF THESE GUMS.

(THIS IS AN EXAMPLE WHICH HAS A GREAT DEAL OF IM-
(
(PORTANCE IN VARNISH MAKING AND THAT A PRACTICAL
(
(VARNISH MAKER SHOULD ALWAYS BEAR IN MIND.

Let us now consider a third case which may happen in mixing several gums and melting them together:

We will take, as in the first example:

25	POUNDS	ZANZIBAR PALE	A.
25	"	BENGUELA	B.
25	"	ANGOLA	A.
25	"	SIERRA LEONE	#2.

We know already what the result will be. All these gums belong to the "Copal" family and are "Copal" Gums. Furthermore, they are soluble in each other's elements, and they "WORK WELL TOGETHER", at least in the Varnish kettle.

The importance of knowing beforehand whether or not a gum will "WORK WELL" with another, or will only melt well with others, cannot be better illustrated than by the following experiment.

We will suppose that the four different gums, ZANZIBAR, BENGUELA, ANGOLA and SIERRA LEONE are now in the Varnish kettle;

the whole mixture in a perfectly fluid state and kept at a temperature above the POINT OF FUSION; and we will melt separately in another kettle:

25 POUNDS OF MANILA GUM.

We have intentionally selected "HARD MANILA GUM" for the reason that it is also a "HARD COPAL" like ZANZIBAR, ANGOLA, BENGUELA and SIERRA LEONE. Like these, after being melted it is readily soluble in Naphtha and Turpentine. It furthermore presents identical characters chemically and physically; its specific gravity is about the same. Not only this, but physically the similarity of Manila with the four other gums is yet accentuated by the fact that it is also a HARD COPAL. However, despite all these points of analogy, MANILA GUM cannot be associated with melted ZANZIBAR, ANGOLA, BENGUELA or SIERRA LEONE. It does not melt with them; it is not soluble, as these four different gums are, in each other's elements. Or, as the Varnish makers put it: "When melted with them, the preparation GOES BACK ON YOU".

The reason for this strange behavior of Manila is yet unexplained; and the example we give plainly tells how very little chemistry has been able to unravel concerning the mysterious nature of certain Varnish gums, and the reactions which take place when they are mixed together after being liquified or melted at a temperature above their POINT OF FUSION.

#1146. This being said, we will now see what the result is going to be in the example already presented. We have in the Varnish kettle on fire, at a temperature as high as 540 deg. F., consequently in a perfectly fluid state, a clear and transparent preparation composed of:

25 POUNDS OF ZANZIBAR.
25 " " BENGUELA.
25 " " ANGOLA.
25 " " SIERRA LEONE.

In another kettle separately we have:

25 POUNDS OF HARD MANILA GUM.

equally well melted.

Using now a copper scoop, we will carry the MELTED MANILA right in the kettle where the four other Copal gums are already melted, not losing sight of the fact that it requires only 380 to 395 deg. F. to keep Manila gum perfectly melted and at a temperature above its POINT OF FUSION; while it requires not less than 540 deg. F. to keep the mixture of ZANZIBAR, ANGOLA, BENGUELA and SIERRA LEONE in the same state of fusion.

Under these conditions of experiment, it would seem natural that the melted Manila should be "taken up" immediately or

readily dissolved by a much hotter preparation of melted gums having the same nature (Copal); it is, however, the contrary which takes place.

#1148. As soon as the melted MANILA comes in contact with the mixture of melted ZANZIBAR, BENGUELA, ANGOLA and SIERRA LEONE, instead of dissolving readily it seems to repel the mixture and not even mix with it, but coagulates; and according to the temperature, presents different aspects which are very interesting to study as they will guide the operator in other experiments.

At 560 deg. F., which is 160 deg. F. above the POINT OF FUSION of Manila Gum, this remains in suspension in the melted mixture of four gums already described partially coagulated, and the whole preparation showing a tendency to stiffen or liver up.

At 540 deg. F., which is 140 deg. F. above the POINT OF FUSION of Manila gum, this coagulates entirely, and becomes viscid; the separation of the melted Manila from the melted mixture is complete, but cannot be noticed at sight in the Varnish kettle, as the Manila sinks to the bottom.

At 510 deg. F., the whole preparation thickens, becomes viscid, and if kept on the furnace any longer, will take fire.

Such as it is, the preparation is worthless and unfit for use in Varnish making, as it cannot be rendered fluid by the addition of a thinner, neither can it be kept on fire any longer for further treatment.

#1150. The loss of the whole preparation can only be avoided by the addition of 50 pounds of FRENCH ARTIFICIAL KAURI (see its preparation), or same amount of NEUTRALIZED ROSIN, which should be at once shoveled into the kettle after this has been removed from fire.

The FRENCH ARTIFICIAL KAURI melts readily and the kettle must be at once covered up; through the cover the contents of the kettle must be kept constantly stirred so as to distribute the FRENCH ARTIFICIAL KAURI through the whole mass uniformly and rapidly.

FRENCH ARTIFICIAL KAURI or any RESINATE OF GLYCERINE or any ROSIN which has been previously NEUTRALIZED and HARDENED, presents this peculiarity that: WHEN ASSOCIATED WITH MELTED MANILA, IT RENDERS THE LATTER SOLUBLE IN MELTED COPAL, BE IT ZANZIBAR, BENGUELA, SIERRA LEONE, ANGOLA or KAURI.

But the proportion in which MELTED MANILA thus treated becomes soluble in these gums is comparatively small, and under the most favorable circumstances could not be higher than 20 per cent.

Any kind of Copal, be it ZANZIBAR, ANGOLA, BENGUELA, NORTH COAST, SIERRA LEONE or KAURI GUM, after having been melted with 20 per cent of RESINATE OF GLYCERINE or RESINATE OF LIME and thoroughly combined with it, will become soluble in MELTED MANILA, and vice versa.

#1155. Hard Manila will be rendered soluble in the proportion of 20 per cent of its weight in ZANZIBAR, BENGUELA, NORTH COAST, SIERRA LEONE, ANGOLA or KAURI, by its treatment with a RESINATE OF GLYCERINE.

This point has a good deal of importance in Varnish making, especially in questions relating to the production of cheap FURNITURE VARNISHES, FURNITURE COACH and AGRICULTURAL IMPLEMENT VARNISHES, where a beautiful lustre, quick drying, hardness and reasonably good wear have to be combined with low prices in order to meet successfully competition.

And what is true about Manila in Fat Varnishes is also true in Alcohol Varnishes. For instance, Manila is soluble in Alcohol and Shellac is soluble in alcohol to the same extent; but if we mix the two solutions together, the Shellac will repel the Manila and even will be precipitated.

The two solutions can only be associated together by a previous treatment similar to the one above described, or through the use of a certain proportion of Resinate of Glycerine, which under the action of a temperature above the BOILING POINT of alcohol in a closed vessel, will render Manila soluble in Shellac or Shellac soluble in Manila.

TABLE SHOWING COMPARATIVELY

The results of my experiments at the Varnish kettle with a view to determinate accurately

THE MELTING, THE BOILING & THE FLASHING POINT

OF

ALL SORTS OF RESINS AND GUMS

used in Varnish Making.

NAME OF THE MATERIAL.	Melting Point.	Boiling Point.	Flashing Point.	Specific gravity.
Zanzibar Ext. Pale A	482° F.	516° F.	695° F.	1070
Zanzibar Pale B.	480	514	693	1068
Zanzibar C.	446	508	691	1065
Zanzibar Siftings,	445	507	690	1064
Zanzibar Pickings,	439	505	689	1060
Amber or Succinum,	593	641	879	1002
Sierra Leone, Ext. Pale,	362	432	594	1069
Sierra Leone, Dark,	379	460	598	1065
Angola,	425	569	695	1053
Benguela,	417	507	674	1048
North Coast,	435	548	663	1062
Hard Manila, Ext. Pale,	410	468	569	1065

NAME OF THE MATERIAL.	Melting Point.	Boiling Point.	Flashing Point.	Specific Gravity.
Hard Manila Pale,	402° F.	460° F.	563° F.	1060
Hard Manila, Brown,	400	458	561	1059
Soft Manila, Pale,	379	435	550	1058
Soft Manila, Dark,	375	430	555	1056
Animi,	453	507	689	1068
Kauri XXX,	463	509	634	1082
Kauri XX,	457	506	631	1080
Kauri X,	455	502	630	1079
Damar Batavia,	265	314	495	1080
Damar Singapore,	263	310	493	1090
Gum Elemi,	219	343	593	1080
Mastic,	266	315	431	1073
Turpentine Gum,	259	303	423	1054
Hard Prepared Rosin,	228	352	395	1070
Resinate of Lime,	229	355	398	1072
Water White Rosin,	206	315	375	1063
Medium Colored Rosin,	207	317	377	1065
Dark Colored Rosin,	208	319	379	1067
White Camphor Gum,	347	395	563	990
Paraffine Wax,	165	275	567	943
Asphaltum,	222	349	448	998
Burgundy Pitch,	169	300	410	1085

B L E N D I N G   V A R N I S H   G U M S

through

The melting process, right in the copper kettle.

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When a Varnish Gum has been liquified by heat in the copper kettle, it has not only become a vehicle but also a solvent; and as such it can dissolve other fluids and solid bodies such as chemicals, metallic oxides, oxidizing agents, resins, coloring substances and varnish gums.

The solubility of a Varnish gum in another Varnish gum or resin previously melted and liquified at a temperature above its POINT OF FUSION, is another question ill understood generally by the majority of Varnish makers.

Not a single Varnish gum, be it the product of a tree, a fossil or a semi-fossil resin, could be found that another varnish gum, another fossil or semi-fossil resin, after being liquified by heat, will not take up or dissolve in more or less proportion, thus forming a new compounded gum resin presenting peculiarities of its own somewhat different from the peculiarities of each component gum considered separately.

The proportion in which a gum or resin can be dissolved by another gum or resin previously liquified by heat in the copper kettle, is sometimes very large; in fact, some gums can be dissolved in another melted gum in almost any proportion, while

it may also happen that only a very small proportion of a certain gum can be dissolved or "taken up" by another.

As an illustration, we will take a fossil gum resin and an artificial resin; KAURI and COLOPHONY, for instance.

If we melt in a copper kettle the Kauri gum, it will require a temperature of 465 deg. F. before this Kauri will become perfectly fluid. At this moment, if we add to it gradually lumps of common Rosin or Colophony, this will be at once melted by the temperature of the melted Kauri; it will also be entirely "taken up" or dissolved, forming a compound fluid resin which will partake of some of the HARDNESS of Kauri and the SOFTNESS of Colophony.

If we allow the mixture of these two resins to cool down and solidify, the resulting resin will possess peculiar characteristics entirely different from that of Colophony and Kauri.

If we take now this compounded resin and place it in a copper kettle, then heat up again so as to ascertain its POINT OF FUSION, we will notice that this melting point is lower than that of Kauri and higher than that of Rosin; the Flashing Point will be higher too. As to the behavior in cold solvents, such as ALCOHOL, BENZOLE, NAPHTHA and TURPENTINE, it would be found also entirely different. It seems as if the resulting resin is not the result of a mere mixture, but that of a chemical combination.

In this case, the effect of such combination will increase the dissolving power of the resulting compound.

THE BLENDING OF VARNISH GUMS is sometimes impossible owing to the peculiar nature of these gums; Orange Shellac, for instance, cannot be "taken up" by melted Kauri or melted Copal in a proportion larger than 6% in weight; still, this comparatively small proportion of shellac in melted Kauri does not "KEEP"; in other words, it will not remain associated with a Copal in the state of a perfect solution after the operation of thinning down, but will gradually settle, forming a thick sediment.

There are other cases when the BLENDING OF VARIOUS GUMS is rendered impossible, not owing to the difference existing in the nature of the gums, but owing to a peculiar characteristic such as noticed in hard Manila. The blending of Manila and Kauri in the Varnish Kettle is utterly impossible under ordinary circumstances. Still, Manila and Kauri are two varieties of a gum Copal or two fossil resins of a similar nature.

SHELLAC or MANILA, however, can be rendered soluble in MELTED KAURI so as to prevent their separation after the operation of thinning down. This can only be accomplished by the use of what may be termed a GUM VEHICLE or a third ingredient of a resinous nature which will bind together the Shellac and the Kauri or the Manila and Kauri. The gum vehicle acts exactly in the same manner as a MUCILAGE or an emulsion; it insures the homogeneity of the compound and prevents the SETTLING or SEPARATION.

The best GUM VEHICLES known are: CAMPHOR GUM, MASTIC, ELEMI, BURGUNDY PITCH, GUM BENZOIN, RESINATE OF GLYCERINE and FRENCHAARTIFICIAL KAURI.

It is very seldom that Shellac has to be melted with Copal; but this may happen, for instance, in the preparation of a peculiar grinding Japan especially adapted to the manufacture of Carriage Paints. In such case, it would be utter impossibility to associate together the Shellac, the Kauri and the Oil, without the use of a "GUM VEHICLE" such as Elemi and Camphor.

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HOW TO SAVE A "BATCH" OF MELTED GUM WHICH HAS "GONE BACK" ON YOU.

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#1190. Every operative Varnish maker knows by experience that the addition of a Prepared Oil not adequate to the kind of gum melted in the Varnish kettle, may cause this to partly solidify or become viscid to such an extent that the whole mass gradually livers up, and the part of it which is near to the bottom of the kettle is burnt instantly.

Should the kettle containing a mixture of oil and gum in such a condition be allowed to remain only five minutes over the fire place, the whole mass enters in ignition and the "BATCH" is entirely lost.

Every hard gum, as it has been already said, presents peculiarities of its own during the process of melting in the Varnish kettle, and every sort of Prepared Oil presents also peculiarities entirely due to the oxidizing compound used to render it quick drying. The association of gums and oils cannot be possible if either the oil or the gum contains only one element capable of producing a reaction.

For instance, in the manufacture of Quick Rubbing Varnish made from 100 lbs. of KAURI and only 6 gals. of PREPARED OIL, if

as soon as the gum is melted and perfectly liquified, the operator adds to it, using a funnel passing through the cover, the requisite amount of six gallons of a BORATE OF MANGANESE OIL too heavy in body or having been made from a quantity of BORATE larger than necessary, as soon as the oil and the melted gum will be intimately mixed together o n fire the whole mass will become viscid no matter how careful the operator may be in removing quickly the preparation from the fire.

#1195. If instead of using BORATE OF MANGANESE OIL in the proportions above indicated, a LEAD OIL, an UMBER OIL had been used, the drawback above referred to would not have happened unless the kettle had been left on fire for fifteen or twenty minutes without stirring.

As a general rule, no matter how an oil has been oxidized by the use of chemicals or by the direct action of a current of air, it cannot be kept associated with the melted gum on fire when the proportion of the oil is less than 7 gals. per 100 lbs. of gum used. Above this proportion of oil there is not so much danger, providing that this oil be perfectly fluid; or in other words, not too heavy in body.

It is a fact well known that a very heavy body oil cannot be COOKED, MIXED or ASSOCIATED with a melted gum on fire without the whole mass CURDLING; and this is especially the case when the oil referred to possesses a degree of "TOUGHNESS" such as can be

noticed in the heavy oils made nowadays by the thickening action of a constant current of air, or by a prolonged and rapid agitation.

When a "BATCH" of melted kauri livers up on fire in contact with an improperly made oil, the first thing to be done is to remove the kettle at once from the fire and shovel into it 20 lbs. of FRENCH ARTIFICIAL KAURI per every 100 lbs. of KAURI GUM that is in the kettle.

The temperature is sufficient to liquify the rosin from which the French Artificial Kauri is made, and at the same time the whole mass becomes liquid again and the operation can be conducted so as to produce a varnish calculated according to the ingredients actually in the kettle.

ZANZIBAR GUM livering up in contact with an oil improperly made could be rendered liquid again by the use of 15 lbs. of FRENCH ARTIFICIAL KAURI made from WATER WHITE ROSIN.

MANILA livering up in kauri can be rendered liquid again by the addition of 25 lbs. of ARTIFICIAL KAURI and 1/2 lb. of GUM BENZOIN per every 100 lbs. of HARD GUM.

Should a preparation of melted gum or resins take fire, it is not always lost if the cover of the kettle can be instantly put on and the kettle removed from fire. This precaution is generally known to operative varnish makers.

PART No. XII

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS ON COOKING OILS AND GUMS.

Part No. XII.

Q U E S T I O N S O F

COOKING OILS AND GUMS.

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INFLUENCE OF "COOKING" PROPERLY OILS AND GUMS

upon the result

I N   V A R N I S H   M A K I N G .

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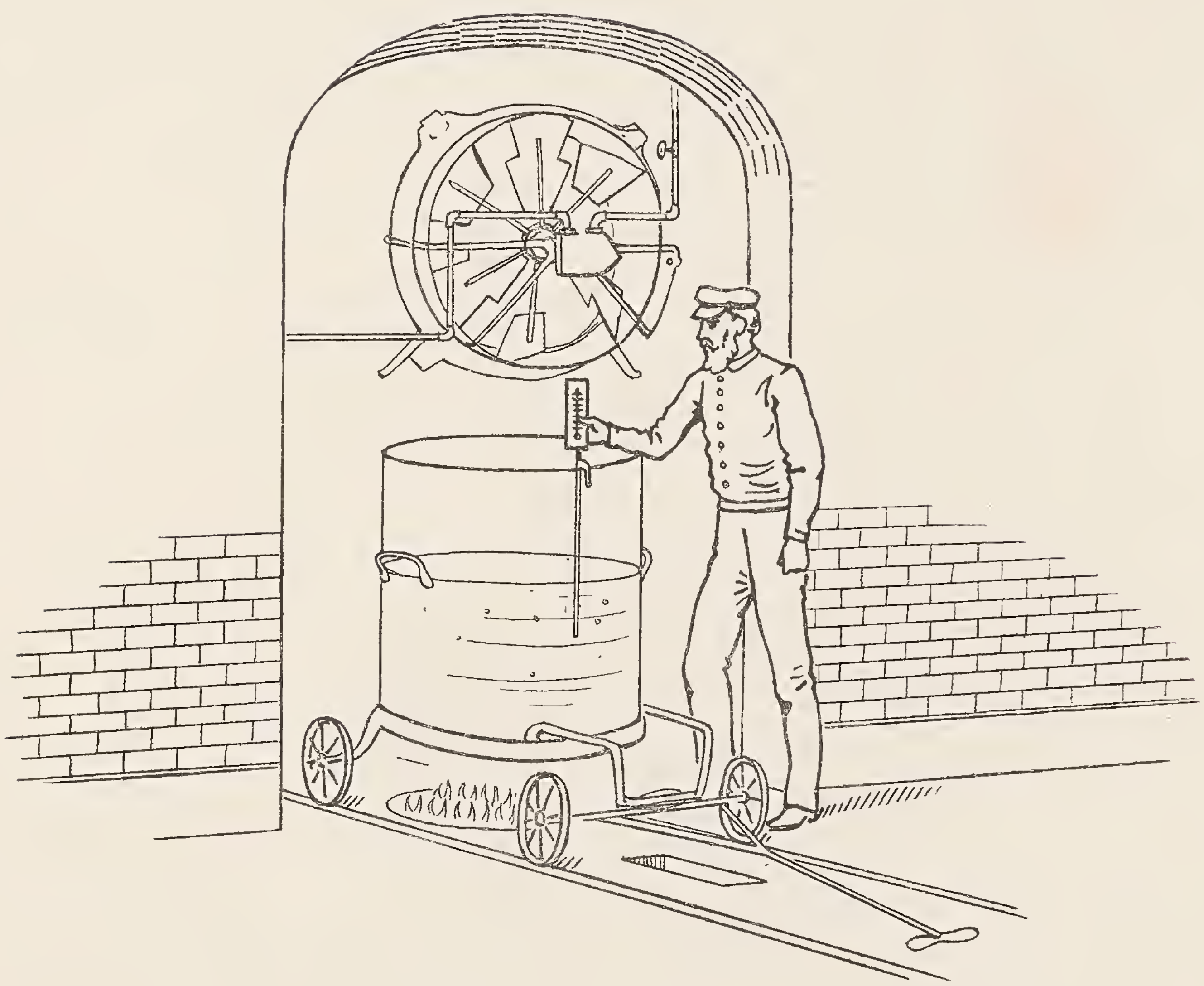
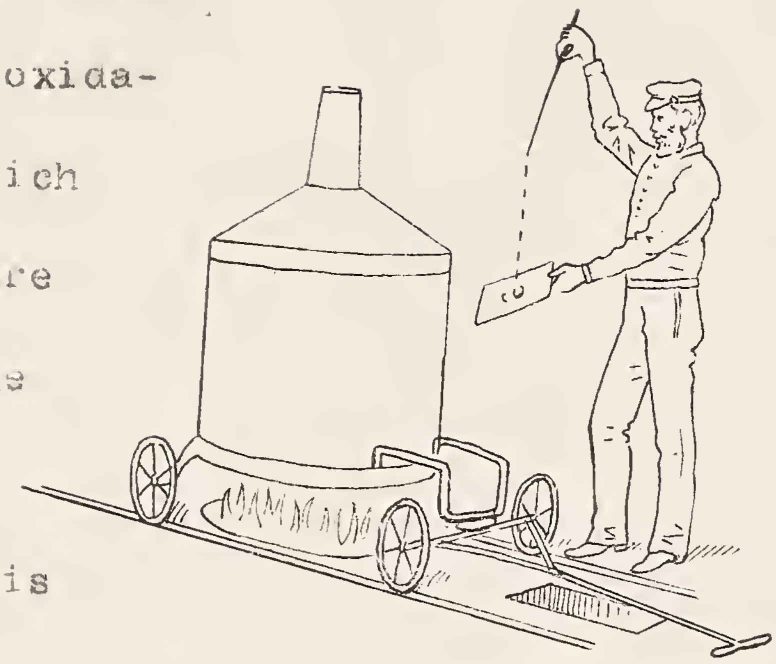
#1300. Aside from the very important question of temper-



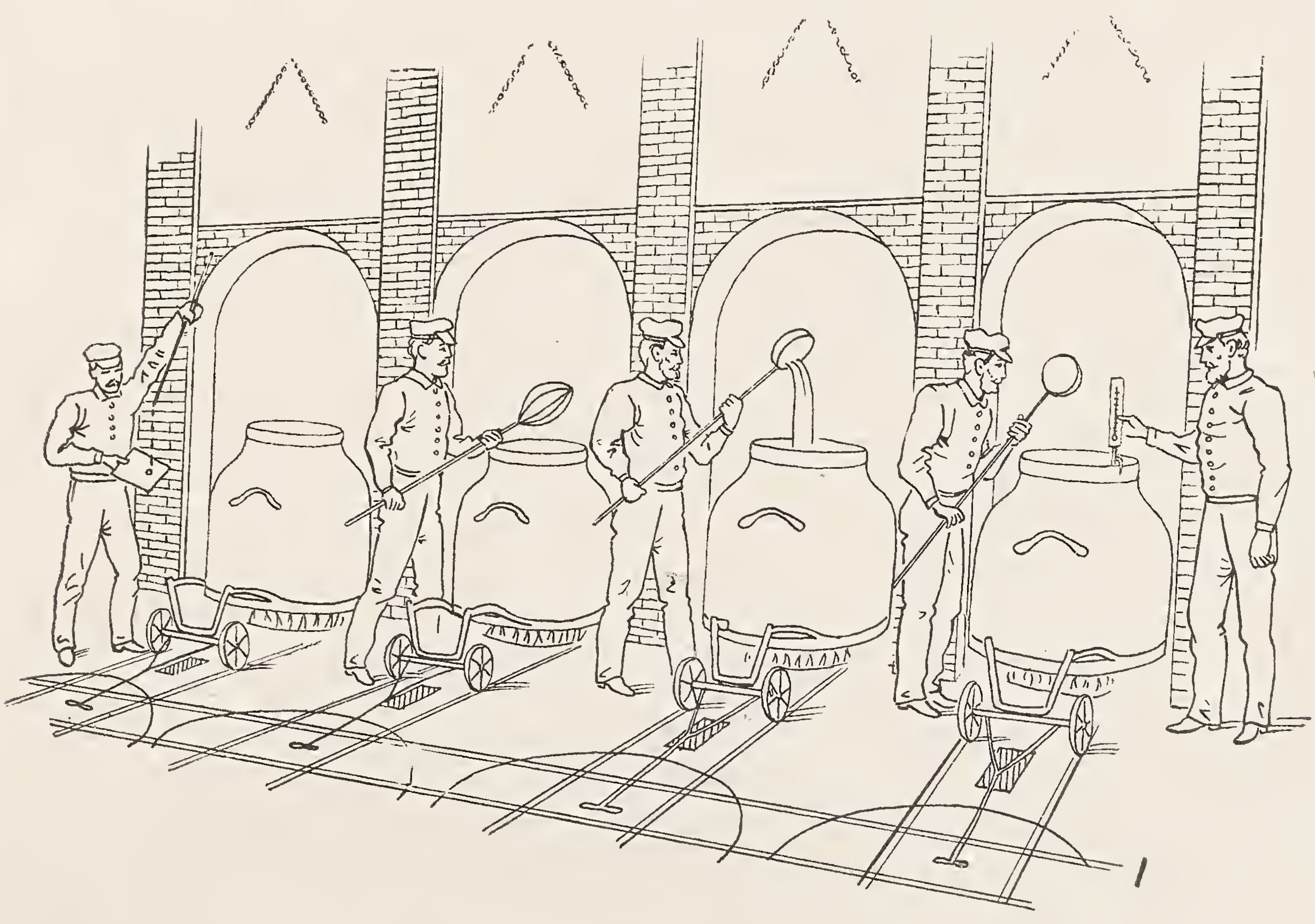
ature which has been at length explained in chapter No. I, there is another phase of the process in Varnish making which has also a capital importance and on which depends in many cases the result. We are referring to what is called the "PROPER COOKING".

It would be impossible to explain in writing how the

"COOKING" of a gum with an oil should be conducted, as there are no well defined rules. The nature of the gum, the degree of oxidation of the oil, the purpose for which the finished product is intended, are some of the considerations which the Varnish maker must bear in mind in conducting the operation which is named "COOKING".



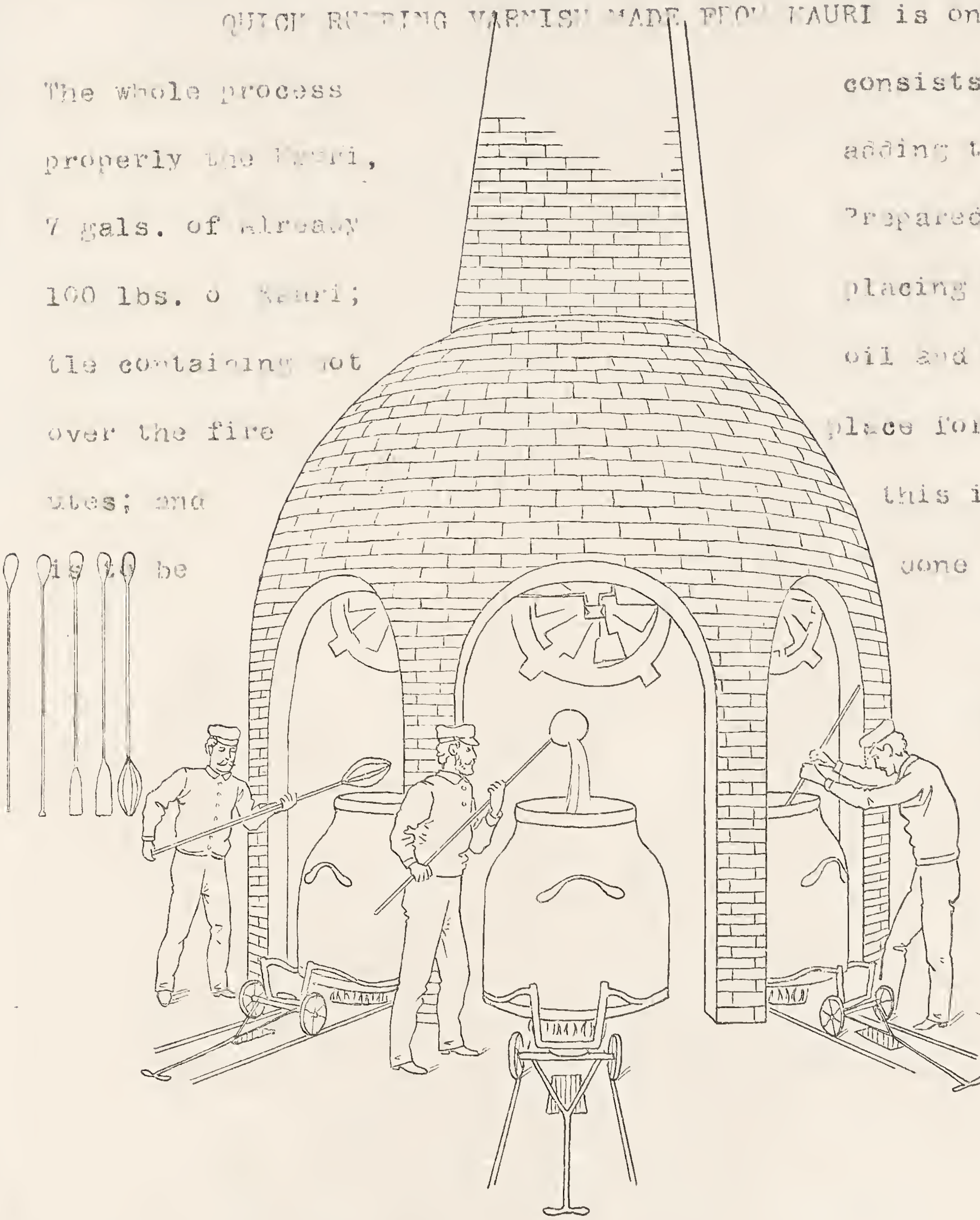
After the gum resin has been properly melted, and the proper quantity of oil thoroughly incorporated with it, certain



Varnishes require no further treatment than to be thinned down,

either with Naphtha or Turpentine to the consistency desired.

QUICK RUBBING VARNISH MADE FROM KAURI is one example. The whole process consists in melting properly the Kauri, adding to it from 5 to 7 gals. of already Prepared Oil per every 100 lbs. of Kauri; placing then the kettle containing hot oil and melted gum over the fire place for about 20 minutes; and this is all which is to be done as far as the



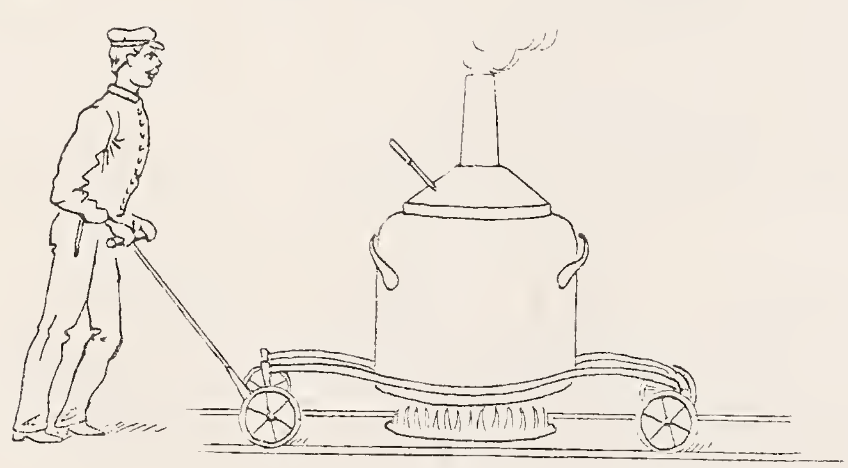
action of heat is concerned. Such Varnishes are very rapidly made; in fact, it is only a question of proportions, and what is called "COOKING" in this case is unnecessary. A "BATCH" of Quick Rubbing made in that way can be turned out every hour.

But there are many other Varnishes which require a much longer treatment and further manipulations before the kettle can

be removed from the fire place.

According to the object for which the Varnish is intended, it has to be "COOKED" or only heated a very short time and just enough to incorporate oils and gums together.

#1210. Rubbing or polishing Varnishes must naturally possess the maximum degree of hardness, while Varnishes for leather, for instance, must be just the reverse and present the maximum degree of elasticity and softness. The "COOKING" in these two examples should be conducted in an entirely different manner, and there is no necessity to insist any longer on this point as it is generally supposed that a Varnish maker of experience knows when he makes a "BATCH" of Varnish what is the purpose for which this Varnish is intended.



What is the proper moment to put a kettle on fire or to remove it from fire during the process of making a "BATCH" of Varnish, is a question that depends entirely on the condition of the preparation; and the operator should be always able to judge from the aspect of the Varnish in the kettle, how far the operation has progressed.

If necessary, the cover of the kettle has to be removed, the thermometer put in the preparation and the temperature ascertained.

As a general rule, the best advice to give as to how the "COOKING" of a Varnish must be conducted, is the following:

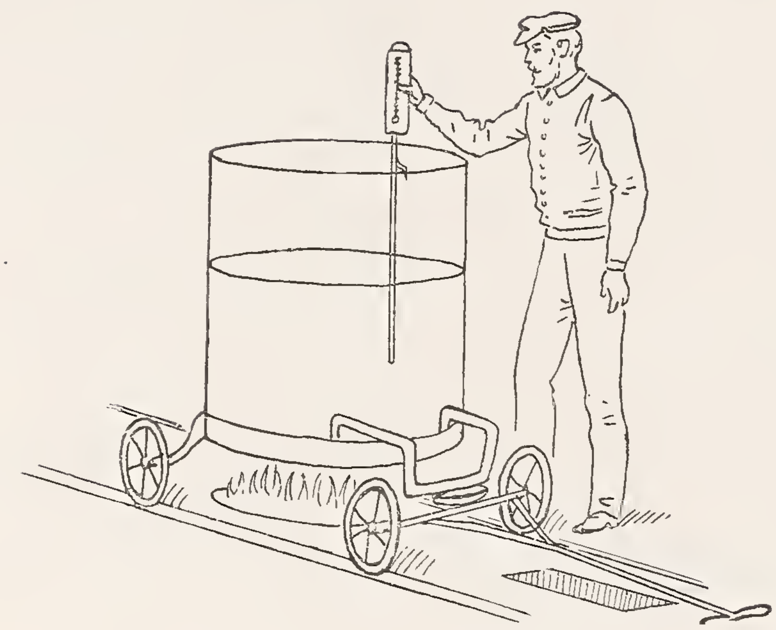
#1220. A "BATCH" OF VARNISH MADE FROM HARD GUM AND OXIDIZED OIL SHOULD BE "COOKED" AT A TEMPERATURE RANGING BETWEEN THE POINT OF FUSION OF THE GUM AND THE BOILING POINT OF THIS GUM.

The above means that the temperature should be conducted so as to avoid the boiling of the preparation on fire; and consequently the kettle should always be at once removed from the fire place as soon as the operator notices that bubbles coming to the surface indicate that the mixture on fire reaches the BOILING POINT.

If at this moment the operator places the thermometer in the kettle and compares the temperature with the tables of melting and boiling points, he will at once see where the preparation is heated more than necessary, or not sufficiently.

WHAT MAKES LINSEED OIL "BREAK"

in the kettle.



#1230. Every Varnish maker is familiar with the disastrous effect of an improper "COOKING" or "BOILING" on raw Linseed Oil.

When Linseed Oil has been treated by direct heat in an ordinary copper kettle to a temperature above 400 deg. F., it may happen that a transformation takes place in its physical properties that can hardly be accounted for. I refer now to the "drawback" known to Varnish makers as "BREAKING" of the oil, and which is supposed to be caused by an improper "COOKING" or the presence of free fatty acids or mucilage in the oil.

When bleached or refined Linseed Oil is used in preparing oxidized oil or for making Varnishes, it very seldom happens that the drawback above referred to takes place; and it has always been my experience that a properly bleached and purified oil stands in the Varnish kettle a temperature as high as 610 deg. F., and

sometimes 625 deg. F. without "BREAKING".

It has also been my experience that no matter how clear may be a bleached oil which has been purified by the Sulphuric Acid process, it always will "BREAK" in the Varnish kettle at a temperature between 450 and 500 deg. F., if this bleached oil has an acid reaction due to improper washing.

All the Linseed Oil sold to Varnish makers under the name of "Bleached" or "Refined", has been treated by the sulphuric acid process; there is no cheaper method, and none which may be considered practical for bleaching large quantities of Linseed Oil at a time, aside from the Sulphuric Acid process.

But after raw Linseed Oil has been refined or bleached by the action of sulphuric acid, it has always such a strong acid reaction that it is absolutely necessary to neutralize it by repeated steamings until all traces of the sulphuric acid have been thoroughly eliminated.

The majority of resins present an acid reaction; this reaction is somewhat neutralized by the metallic oxides used as oxidizing compounds. A faultless Varnish, as a general rule, ought to be perfectly neutralized; and for this reason the use of an oil presenting a strong acid reaction is very often the cause of drawbacks that the most experienced Varnish maker is utterly incapable to determine unless he possesses a little knowledge of chemistry, of reactions and of incompatibles.

But it may also happen that in "COOKING" Linseed Oil at a temperature not above 550 deg. F., this will "BREAK" not because of impurities which may be in the oil in the state of mucilage or fatty acids, but simply because the heating or "COOKING" is not properly conducted.

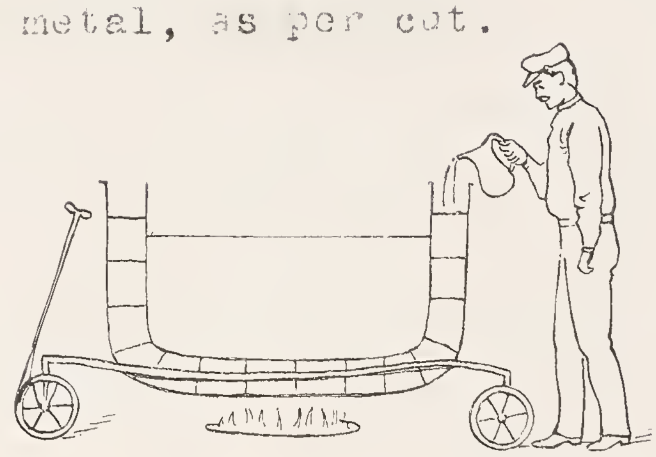
#1240. Although there are no well defined rules for "COOKING" properly an oil to render it such as wanted for making Varnishes, the operative Varnish maker knows well enough that there are many essential points which are the result only of practical experience that he must always have present in his mind when he conducts a "BATCH" of oil. Amongst these points are the following:

1st. The fore must be well lighted and made from coke absolutely free from flame before the kettle is put on the fire place. Should the fire not be well lighted or free from flame, the bottom of the kettle never would be heated uniformly and a part of the oil would perhaps be superheated while another part of the same batch would be at a temperature only one-half. The consequences of this are of great importance; and to name only one, it is utterly impossible to make two "BATCHES" of a prepared oil alike from the very same ingredients unless the fire has been made as above indicated. This is, ONLY FROM COKE and FREE FROM FLAME.

An oil must be heated uniformly through the whole mass. This is an absolute requirement, and in order to insure this uniform temperature of the oil through the whole mass in the Varnish

kettle, many clever devices have been resorted to of late by progressive Varnish makers.

In chapter No. I, on the subject of "Questions of Temperature", mention has been made of the double kettle indirectly heated by a melted metal, as per cut.



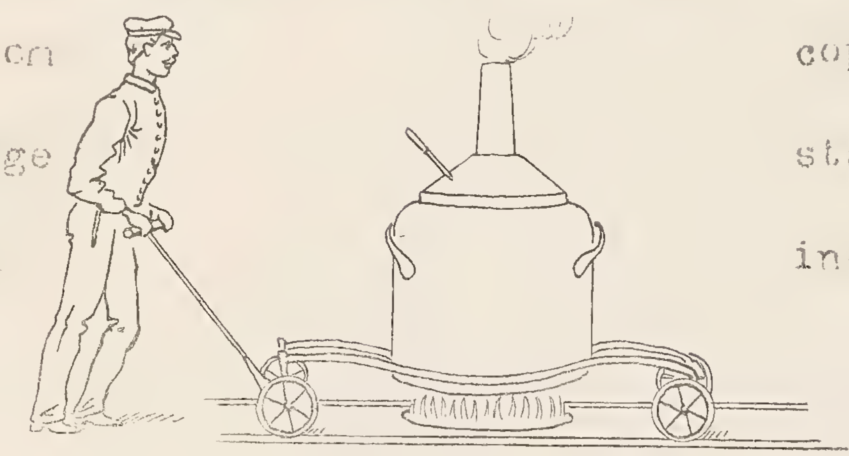
1250. The secret of making exceedingly light prepared Oils rests entirely on the most important question of temperature. During the process of "COOKING", "BOILING" and "OXIDIZING", the new double kettle, as per above cut, constitutes a great improvement over the old method, which will certainly lead sooner or later to the production of prepared oil almost water white.

2nd. When a "BATCH" of oil is treated by the direct heat of an incandescent fire of coke in a single bottom kettle, the operator must be very careful not to leave the temperature of 500 deg. F. longer than one hour.

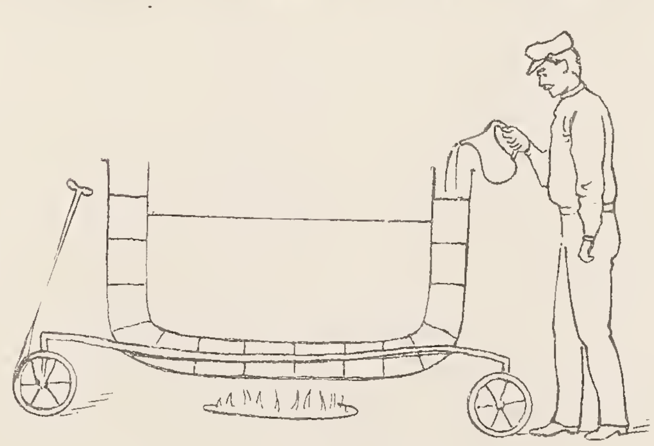
Oil should be heated up as high as 550 deg. as quickly as possible when the bottom of the kettle rests upon a direct fire.

The Varnish maker in preparing Quick Drying Oils must not

loses sight of the fact that while the thermometer shows a temperature of 550 deg. F., there is a temperature as high as 1200 deg. F. sometimes developed by the fire underneath the kettle, and therefore a constant danger of burning or over-heating those parts of the oil which are at the bottom and nearer to the fire. For this reason, I insist on this most important point, that the oil should be heated up as quickly as possible, when the system or method adopted for "COOKING" oils is the ordinary method of direct fire and single bottom copper kettle mounted on track or large stationary iron kettle resting upon an incandescent fire of coke.

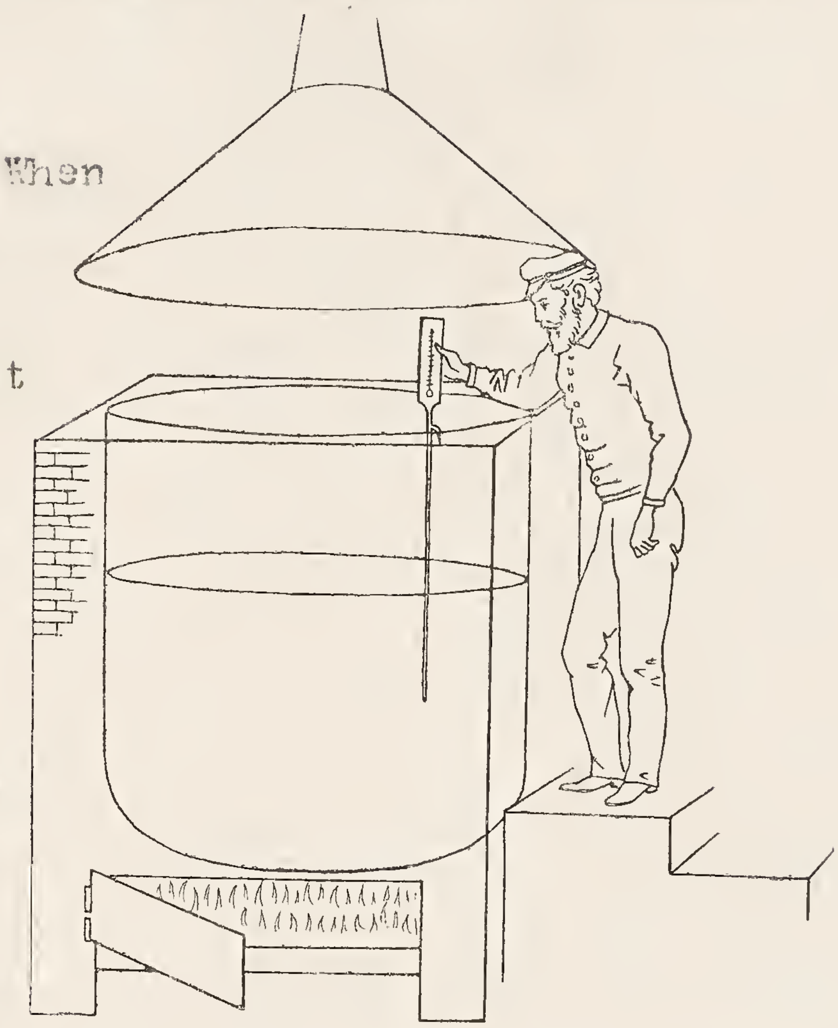


In a kettle like the one above, as soon as thermometer shows a temperature of 550 deg. F., watch this moment and do not allow this heat any longer than 45 to 60 minutes.



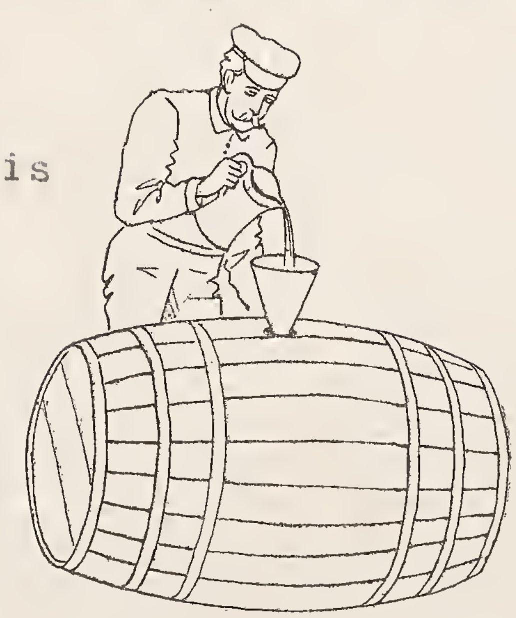
By the use of a double kettle such as this, instead of the ordinary copper kettle, all danger of burning or over-heating an oil is completely avoided. (See Questions of Temperature.)

3rd. The BODY of an oil depends entirely on the way it has been cooked, no matter what kettle has been used in the process.



#1260. When an oil is intended to have great body, consistency and thickness, it is necessary then to heat it up as high as 610 deg. F., taking the necessary precautions to avoid burning or overheating that part of the oil which is in contact directly with the bottom of the kettle, and conducting the heat as per instructions already given for the prevention of an oil from "BREAKING".

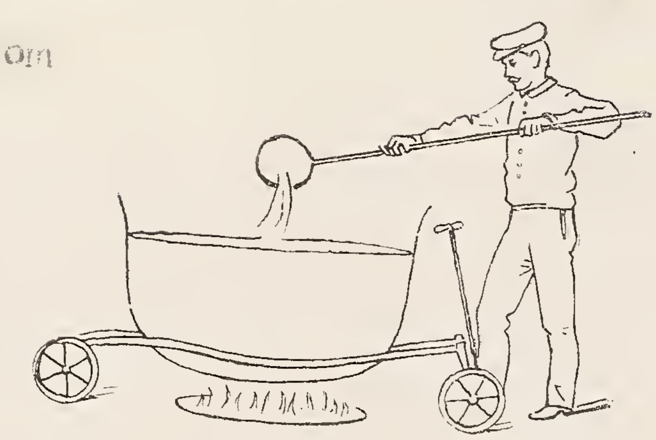
#1270. By the use of "COOLING CHAMBERS" built around the sides of the kettle, the temperature can be regulated; and when the oil is prepared, it is sent directly into a vat where it is allowed to settle and clarify for use in Varnish making.



When the Prepared Oil is not to be used in a Varnish factory, it is then removed from the stationary kettle into a cooling vat, then allowed to settle 24 hours, and from there it is put up in barrels ready for shipment.

4th. When an oil is intended to have a great body, consistency and thickness, and at the same time to be as light as possible, then it is preferable not to use a stationary kettle. The heat is far better regulated in a kettle mounted on truck, and the best results can be obtained by removing the preparation from the fire according to the instructions of the process and the indications of the thermometer.

Bring the temperature very high and quickly, so as to avoid the direct action of fire upon the bottom of the kettle as much as possible. When the thermometer indicates 575 deg. F., remove kettle from fire; take it outside of the heating room and cool down the preparation as quickly as possible until the thermometer shows a temperature of only 225 deg.



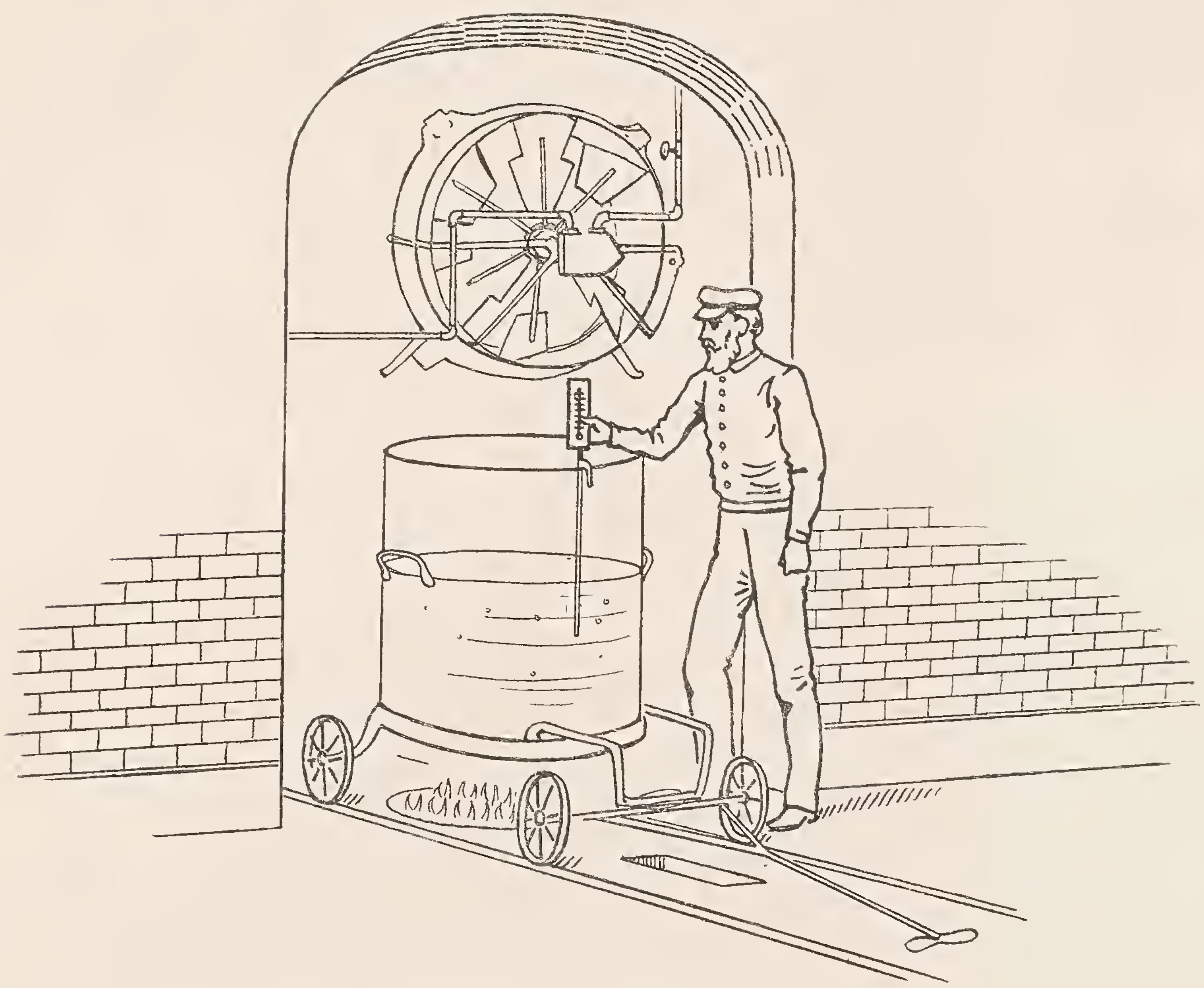
At this stage of the operation, bring your kettle again over the fire, which must be made anew and well lighted so as to enable the operator to conduct the heating very rapidly and get the oil at a temperature of 600 deg. F. as soon as possible.

The less an oil is submitted to the action of a direct fire, the lighter in color is the result and the heavier in body is the Prepared Oil when finished.

Chemicals should be added to an oil at 275 deg. F.

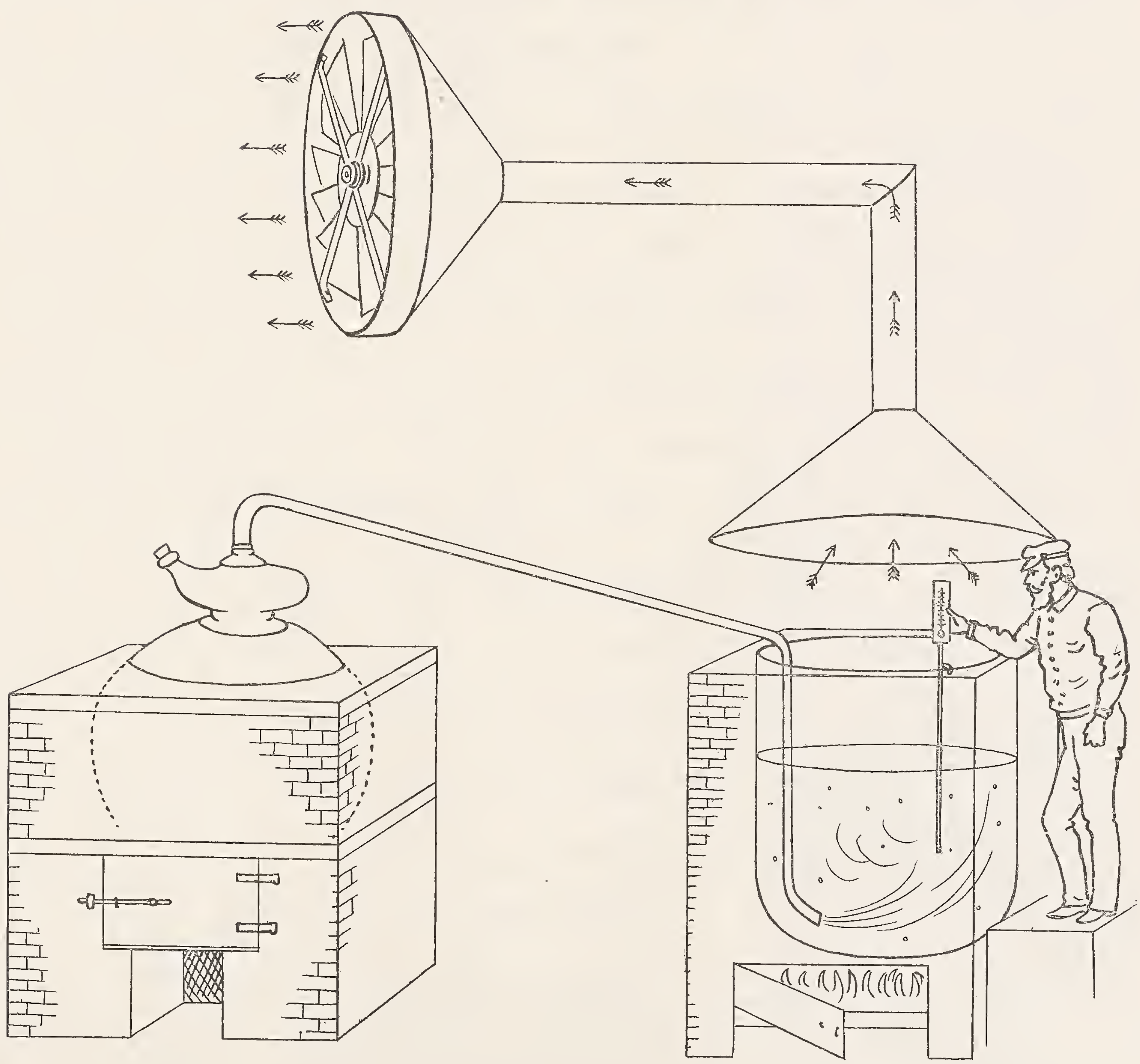
5th. The use of heat exhausters already mentioned in the chapter on factory appliances, will prove of great value in rapidly cooling a prepared oil when necessary.

It is only through repeated heating up and rapidly cooling down that an intensely oxidized oil may acquire this degree of "TOUGHNESS" so desirable for certain purposes, especially in Flowing Varnishes and Lithographers' Prepared Oils.



In my experience of Preparing Oils, I have produced very heavy oils without the use of a heat exhauster and using only an ordinary copper kettle mounted on truck. But these results cannot be compared as far as the lightness in color and the "TOUGHNESS" are concerned, with the results obtained by the heat exhauster.

6th. In the preparation of heavy body oils through the use of a large stationary kettle instead of the ordinary copper kettle or iron kettle mounted on truck, the only way to produce a rapid cooling of an oil after it has been prepared is to force a

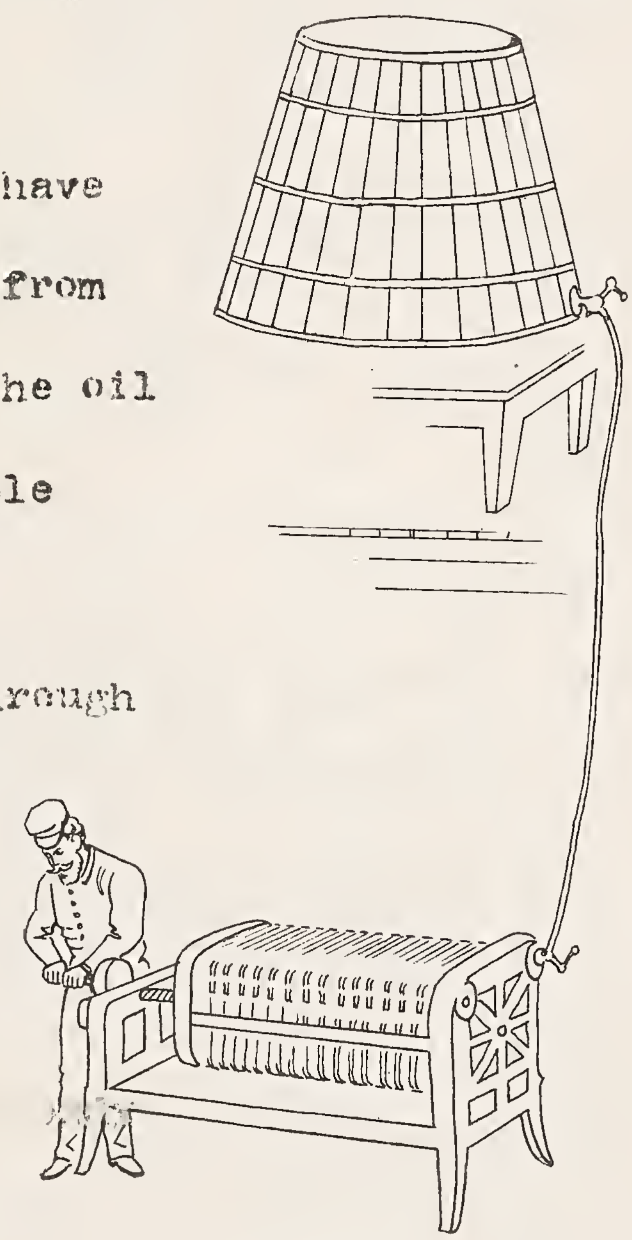


continuous current of cold air through the mass of the oil and have at the same time a heat exhausting apparatus arranged as per cut.

7th. Immediately after a prepared oil has been made with or without the use of the mechanical improvements and appliances already referred to, there is always a certain amount of fatty substances which become insoluble in oil as soon as this is cold, and gradually settle at the bottom if the oil is allowed to stand undisturbed for a certain period.

It requires no less than seven weeks for all these fatty substances to settle.

It is only when these substances have been eliminated, or better said, separated from the mass of the oil through settling that the oil begins gradually to acquire the very valuable features due to ripeness and maturation.



An oil which has been filtered through pressure with a filter press is showing a tendency to increase in thickness rapidly and this only 48 hours after being prepared, while it takes, as it has been already said, not less than seven weeks for a prepared oil put in tanks without filtering before the same results can be noticeable.

Consequently, the use of a filter press is advisable for separating all the insoluble fatty substances above referred to immediately after an oil has been prepared.

#1290.

8th. Oils prepared from Borate of Manganese should be added to the melted gum COLD as a general rule, and cooked into the melted gum gradually, adding the Manganese Oil only a little at a time.

9th. LEAD OILS should be added to the melted gum at a temperature of 275 deg. F.

10th. UMBER OILS should be added to a melted gum at a temperature of 325 deg. F., especially in the manufacture of Varnishes such as No. I Coach.

11th. When more than six gallons of oil to 100 lbs. of gum are required, put in six gallons before removing the cover from the kettle. Then take off the water and replace the kettle on the fire until the oil is cooked into the gum, and add the balance of oil, gradually cooking it in thoroughly.

One of the chief causes of failure in the manufacture of fat Varnishes can be traced generally in the improper treatment or preparation of the oil from which the Varnish is made, or in the use of an oil which is not adequate to the kind of gum or thinner used.

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PART No. XIII

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF OXIDIZING OILS, GUMS AND RESINS.

Part No. XIII.

Q U E S T I O N S

O F

OXIDIZING OILS, GUMS AND RESINS.

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METHODS AND PROCESSES

for

oxidizing Linseed Oil without using chemicals such as Borate, Acetate, Oxalate or Sulphate of Lead or Manganese, by producing a current of cold air, hot air, ozone, ozonized air, or better yet, pure oxygen gas, which acts directly upon the oil without coloring or darkening it, as is the case when using Metallic Oxides.

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¶1600. The processes which we have already described for bleaching, refining, clarifying and purifying Linseed Oil, and especially the sulphuric acid bleaching process, give as a result a product exceedingly light in color and which in Varnish making can be used to far greater advantage than the ordinary raw Linseed Oil such as it comes from the crusher.

Bleached or refined Linseed Oil has over the ordinary raw Linseed Oil the advantage of being almost colorless, which is very desirable for making Varnishes; but it has another quality which renders it much more valuable yet, and this is its behavior at a high temperature. It is not a common thing to see an ordinary Linseed Oil "BREAKING" at a temperature of only 425 to 460 deg. F. and becoming unfit for the manufacture of fat Varnishes.

Refined Linseed Oil, unlike common Linseed Oil, stands without "BREAKING" a temperature as high as 610 deg. F. and in some

instances 625 deg. F. without "BREAKING".

By the action of heat we know already that a partial bleaching of Linseed Oil can be produced in the Varnish kettle even if we strongly oxidize the oil by the use of Borate of Manganese; but if a partial bleaching has been produced, there is a reddish hue imparted to the oil and which is due to the action of Borate. This reddish color renders in fact the oil (as far as color is concerned) less desirable than ordinary raw Linseed Oil.

If Oxalate, Sulphate or Oleate of Manganese are used instead of Borate, the oil thus oxidized assumes a more brownish color; and when oxide of Manganese, commonly named granulated or recovered Manganese, when calcined Umber, Sugar Lead, White Vitriol or metallic oxides such as Litharge or Red Lead, are used as oxidizing agents, the color of the oil becomes much darker yet.

How to produce an intense oxidizing of Linseed Oil without affecting its original color or darkening it in proportion to its drying qualities, as is the case with Borate of Manganese or any other oxidizing compound, or in other words, how to increase the absorbing power of Linseed Oil for oxygen?

The question being one of great importance in the production of colorless Varnishes and Varnish Oils, experiments have been made practically by numbers of chemist Varnish makers in France, England and Germany. In this country also similar experiments were made since the year 1881; and the results which have

been obtained are well worthy of mention. We will give hereafter not only the results but many good suggestions and devices that experience dictates for rendering practical this new principle of oxidation.

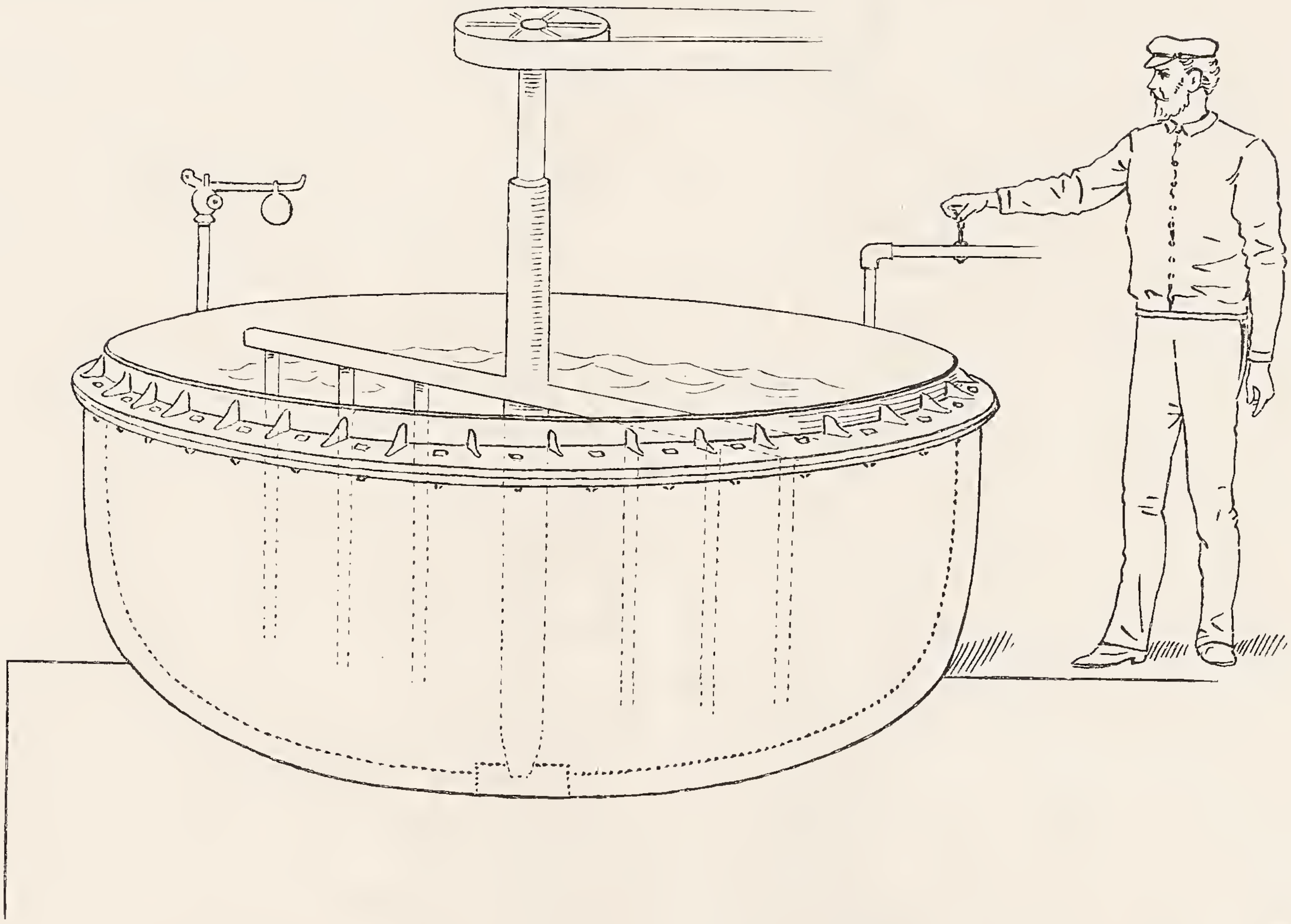
It is a fact well known to Varnish makers that the most important property of Linseed Oil, chemically, is its behavior with oxygen. The change which takes place during the oxidation of Linseed Oil is very complex, and modern science has not yet been able to explain it satisfactorily. There is a radical change in the nature of the oil after this has been oxidized; but this law of oxidation is ill understood, and in order to bring about the oxidation of Linseed Oil under the most favorable circumstances, it is absolutely necessary to know exactly what are the requirements of an oil intended for use in Varnish making. It will be seen hereafter that raw Linseed Oil can be strongly oxidized by the direct action of oxygen, without the use of chemicals, and still be unfit for use in making Varnishes.

By the direct action of a current of air, or a current of oxygen on Linseed Oil, this may be rendered very heavy in body and comparatively quick drying; but such an oil dries soft instead of hard, which is the case when either Manganese or Lead Oxide have been used as oxidizing agents.

The first attempt made to oxidize Linseed Oil directly without chemicals, was through the action of a current of air.

By increasing the speed of the mixer and the quantity of air, the result is somewhat quickened; but it requires no less than thirty-six hours in a kettle as per cut to thicken and oxidize 500 gals. of Linseed Oil by the direct action of air.

Furthermore, an oil thickened by that process dries superficially, while the part underneath the film produced by oxidation remains soft.



In oxidizing Linseed Oil through the use of Litharge or Red Lead, the quick drying oil which is thus obtained is very dark in color comparatively to the drying oil oxidized by the above process; but after being applied, it dries very hard and thoroughly.

If instead of using atmospheric air or a current of hot air, ozonized air is used, the action on oil is much more rapid.

OXIDIZING AND BODYING OR THICKENING LINSEED OIL

by the direct action

of a continuous current of air.

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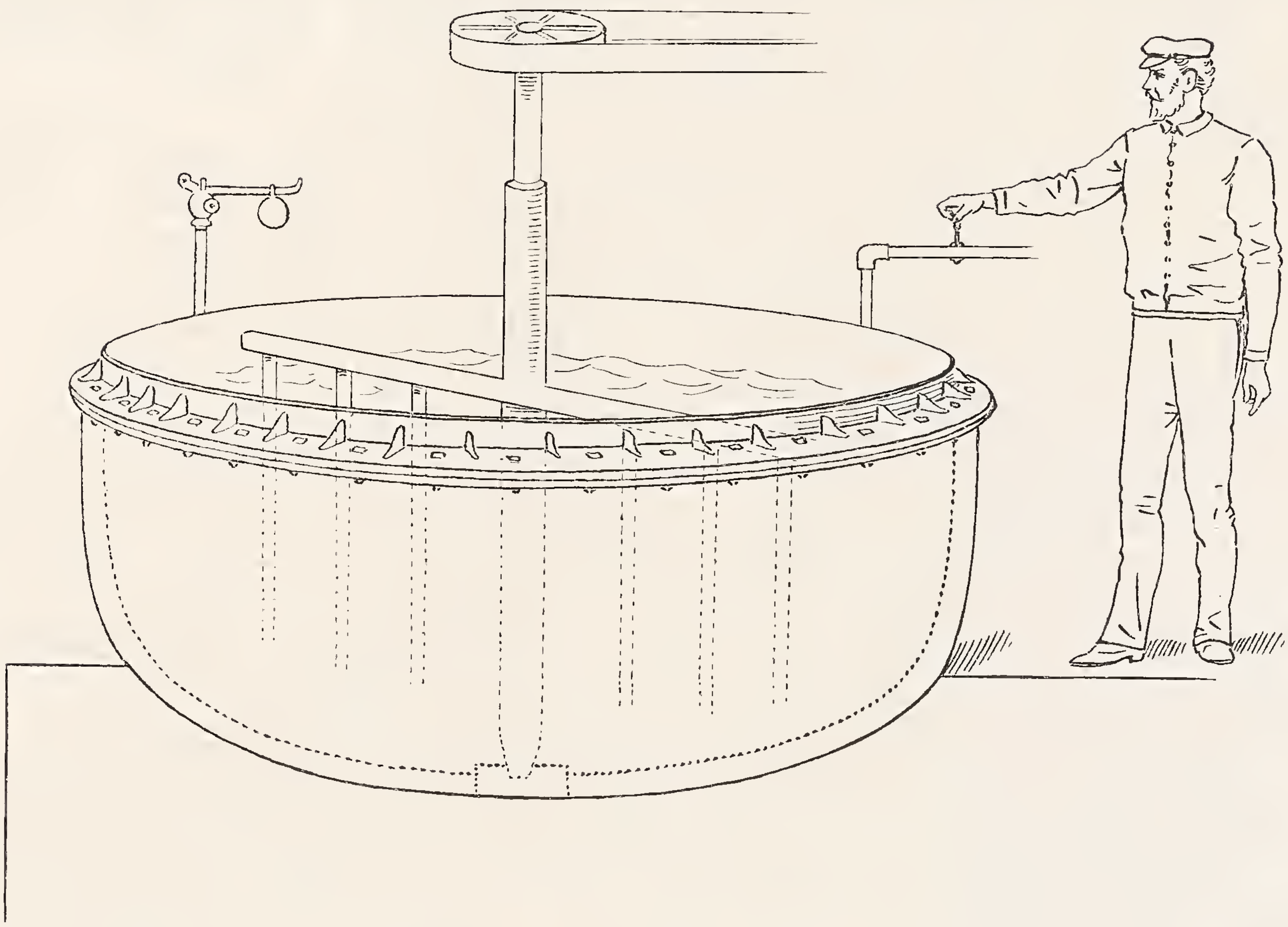
#1 10. By forcing atmospheric air so as to cause a continuous current to pass through a mass of Linseed Oil previously



heated at a temperature of 200 deg. F. in a steam jacketed kettle provided with a mixer, such as the one above, the Linseed Oil can be rendered very heavy in body. If instead of forcing atmospheric air through an air pump or any other forcing apparatus, hot air is continuously distributed under constant stirring through the mass of the oil, this will not only thicken but absorb quite an amount of oxygen and become a drying oil.

OXIDIZING AND BODYING OR THICKENING LINSEED OIL

by the direct action

of a continuous current of Ozonized air.

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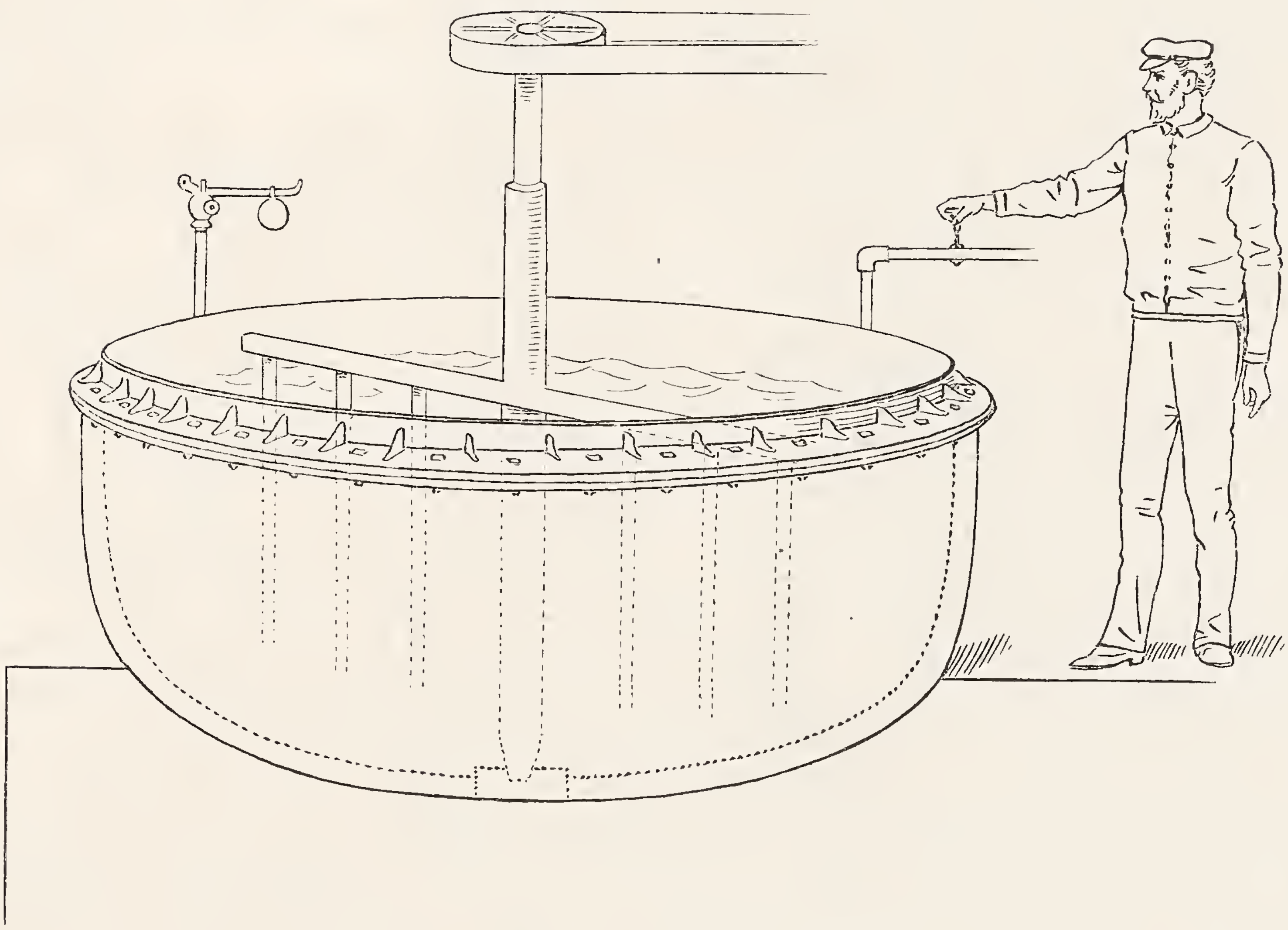
#1320. Ozonized air presents some interest to Varnish makers nowadays on account of its power of oxidation, which is far



superior to that of atmospheric air or hot air.

Ozone cannot be used in its pure state on account of the difficulties of its preparation. The day when it will become possible to produce ozone rapidly and by a simple method, there is no doubt that this oxidizing agent will open new fields in the preparation of Varnish oils. But as the matter stands now, the appli-

cation of ozone directly to the oxidation of oils would involve complicated operations which are not practical in making Varnishes.

The oxidizing power of rosin is such that it decomposes rapidly Lead and Manganese Salts. A piece of paper which has been dipped into a solution of Chloride of Manganese and allowed to dry, becomes a re-agent very sensitive which assumes a brownish color at once when it comes in contact with ozone. This remarkable reaction is of the same nature as the one which is produced when a piece of Blue Litmus paper is dipped into an acid solution.

Ozone decomposes Iodide of Potassium and Iodine is set free; starched paper containing a small quantity of Iodide of Potassium is, therefore, a very sensitive re-agent.

Ozone is not an element, neither is it a combination of Hydrogen and Azote; its effects are due to oxygen in a particular state of chemical activity imparted by electricity.

The preparation of ozone is by itself a complicated affair, and therefore it would not be practical to apply it to the treatment of Linseed Oil. But what can be done easily is to ozonize the current of air which is forced through the oil.

The air must be perfectly dry to have the proper effect on Linseed Oil.

Damp air could pass through an oil for over 72 hours without thickening it to any appreciable extent. The perfect drying of air is a very simple operation.

HOW TO OZONIZE A CONTINUOUS CURRENT OF AIR

intended for

OXIDIZING AND BODYING OR THICKENING LINSEED OIL.

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#1330. By causing a current of air to pass between glass plates covered on each side with tin foil; it can be ozonized instantly.

The atmospheric air is sent through the mass of the oil by a suitable forcing apparatus, but the air must first pass between glass plates covered on each side with tin-foil. Arrange 18 plates, each one 3 feet long and 2 feet wide, in a wooden cause, the plates parallel to each other and about one inch apart. Every alternate plate is connected with the positive pole of a galvanic battery, and the others or intermediate plates are connected with the negative pole. The air is compelled to pass between the plates in succession from end to end of the series and it is then blown through the oil.

One of the best arrangements in the way of a battery consists of 10 cells each containing plates 5 inches long and 3 inches broad of zinc and platinized silver. The battery is excited by sulphuric acid diluted with 7 times its weight of water; during the treatment of the oil with the air, the oil is also subjected to the action of electricity by means of another battery, the conducting wires of which are dipped into the kettle of oil.

OZONIZED AIR PROCESS OF OXIDIZING A VARNISH OIL IN A STATIONARY KETTLE.

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#1340. In a stationary kettle, with a furnace underneath and a heat exhauster above, common raw Linseed Oil was submitted first to a temperature of 250 deg. F.

When at this temperature, a constant current of cold air containing ozone was carried through a lead pipe, P, and the air distributed all through the mass of the oil while this was kept for about 10 hours at a temperature not higher than 250 deg. F.

After 10 hours, a sample of the oil was taken for examination and found to have absorbed about one per cent of its weight of oxygen.

The oil was allowed to cool and stand in the kettle over night. Day after, no film could be noticed over the surface of the oil. The operation was repeated again and conducted exactly as the day before, during 10 hours.

After 10 hours, a second sample was taken and examined, the result showing this time that the oil had absorbed oxygen to the extent of 2 1/2 per cent of its weight.

Allowed to cool in the kettle until the day after, it could then be noticed that a slight film was produced on the surface of the oil, a conclusive proof of the drying property which the oil had acquired by the above treatment.

Applied on a piece of glass, this oil gave evidence of quite a good drying power and became practically dry in 10 1/2 hours. This does not mean that after this time the solidification of the oil was complete, but that the surface only was dry.

After the third experiment, a sample taken from the kettle did not show any increase in the amount of oxygen that had been absorbed. Identical results were confirmed by a fourth operation.

The oil, considered from the standpoint of its color, had lost nothing from its original brightness, which is already an advantage over the use of metallic oxides as oxidizing compounds; but a stronger oxidation of oil than the one mentioned above being necessary for making Varnishes, new experiments were made, this time without air, but exclusively with pure oxygen

PURE OXYGEN GAS OXIDIZING PROCESS OF LINSEED OIL AT A COMPARATIVELY LOW TEMPERATURE.

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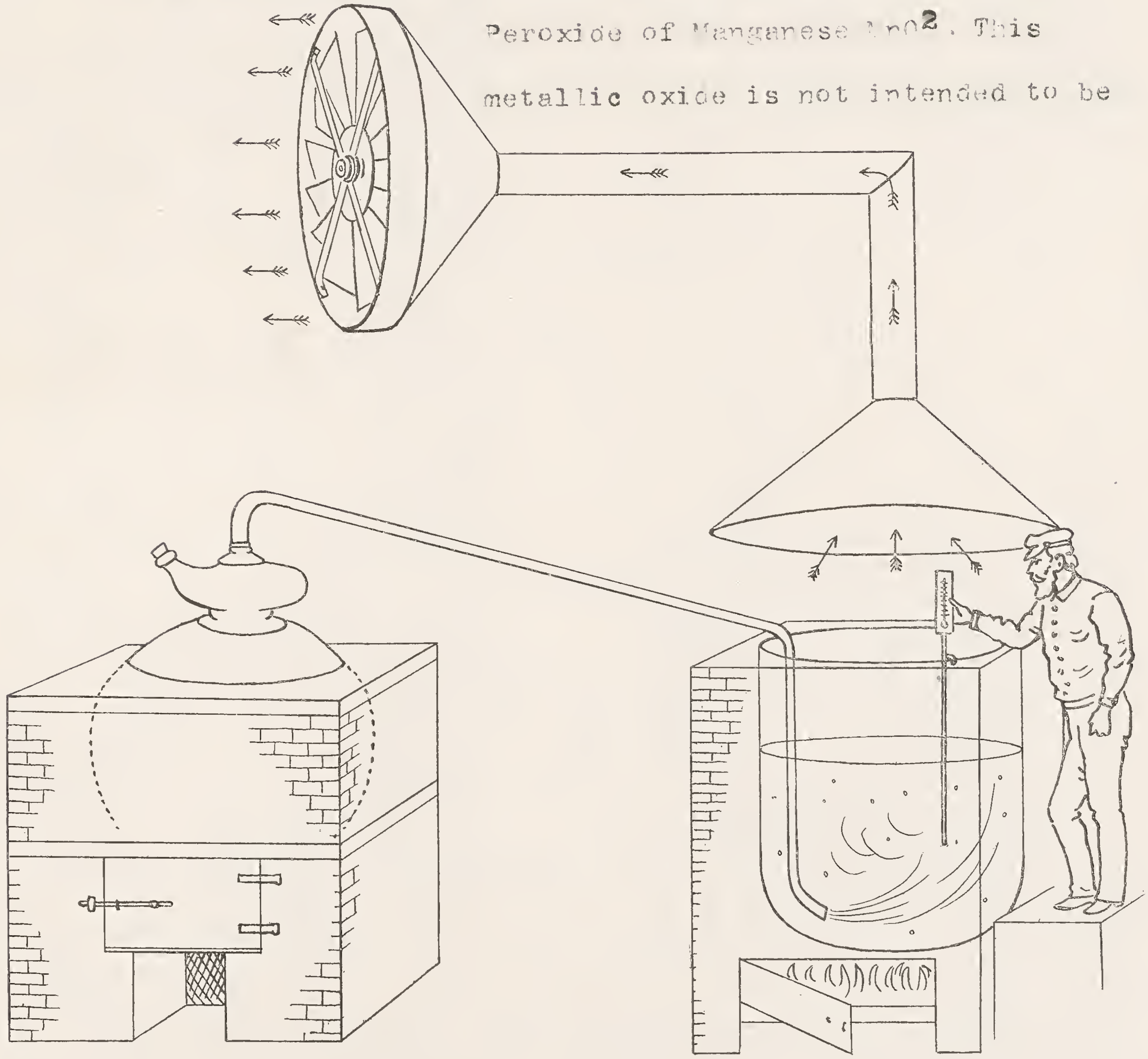
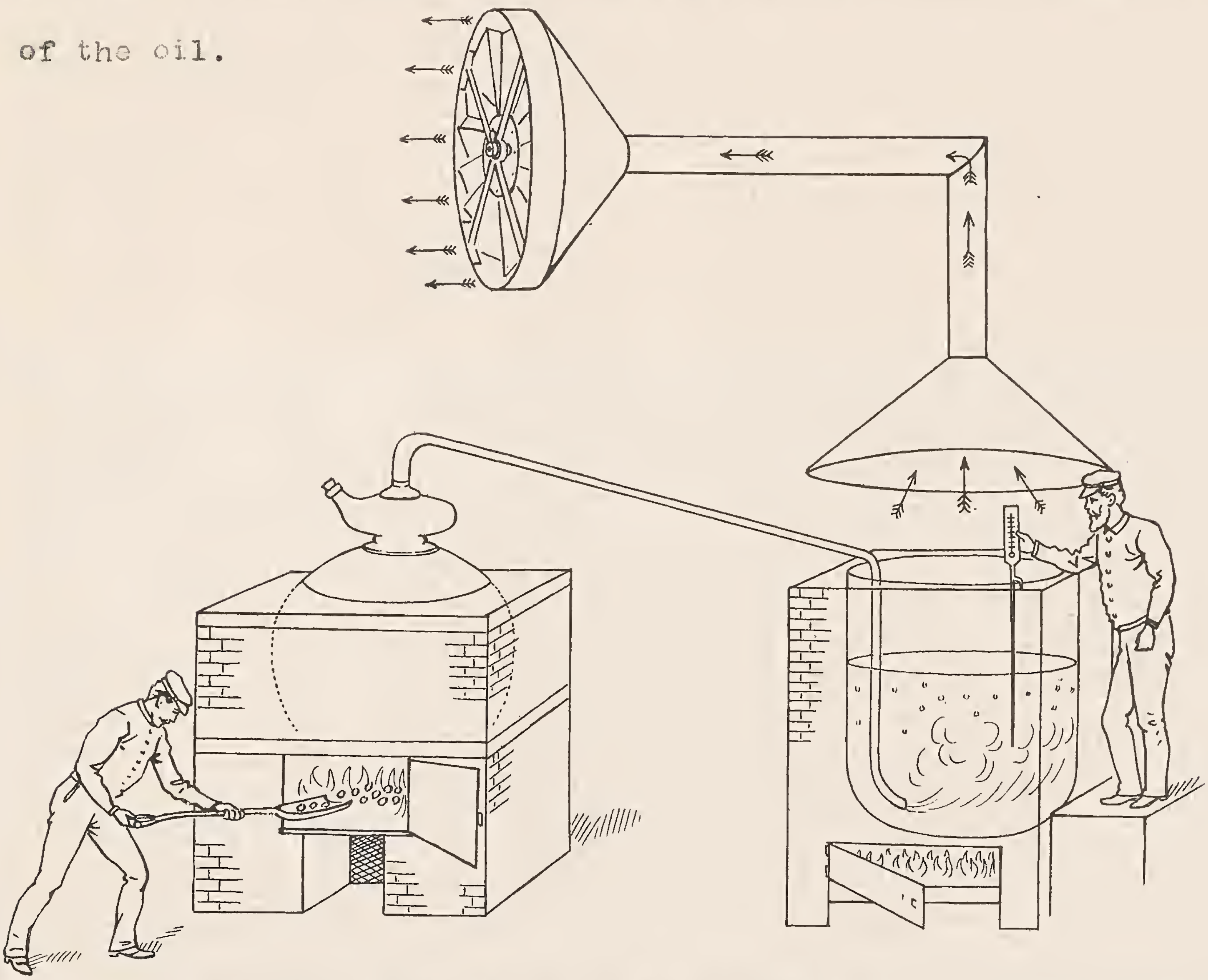
¶1550. The material used for producing the oxygen is Peroxide of Manganese MnO^2. This metallic oxide is not intended to be



put into the kettle with the oil, as it is the case with the ordinary process; it is treated in a separate vessel as per cut and by heat.

When Peroxide of Manganese MnO^2 is exposed to a high temperature, it loses 1/3 of its oxygen and becomes Brown Oxide of Manganese $Mn^3 O^4$.

The apparatus required in this operation consists of a large earthen vessel or retort with a furnace underneath. The end of the retort in connected with a pipe which will bring the pure oxygen and distribute it as soon as produced through the whole mass of the oil.



25 lbs. of Peroxide of Manganese having been placed into the vessel V and this over the furnace with a well lighted fire made of coke, oxygen is immediately produced and the gas finds its way through the pipe P until it reaches P and is distributed all through the oil.

The oil should be heated at a temperature of 300 deg. F. and a cover placed over the kettle. It will be noticed that for about 3 hours large bubbles of oxygen gas are coming to the surface of the oil; after that time, there is but very little oxygen produced. The cover should be left over the kettle for about 8 hours, after which sample of the oil can be taken and examined.

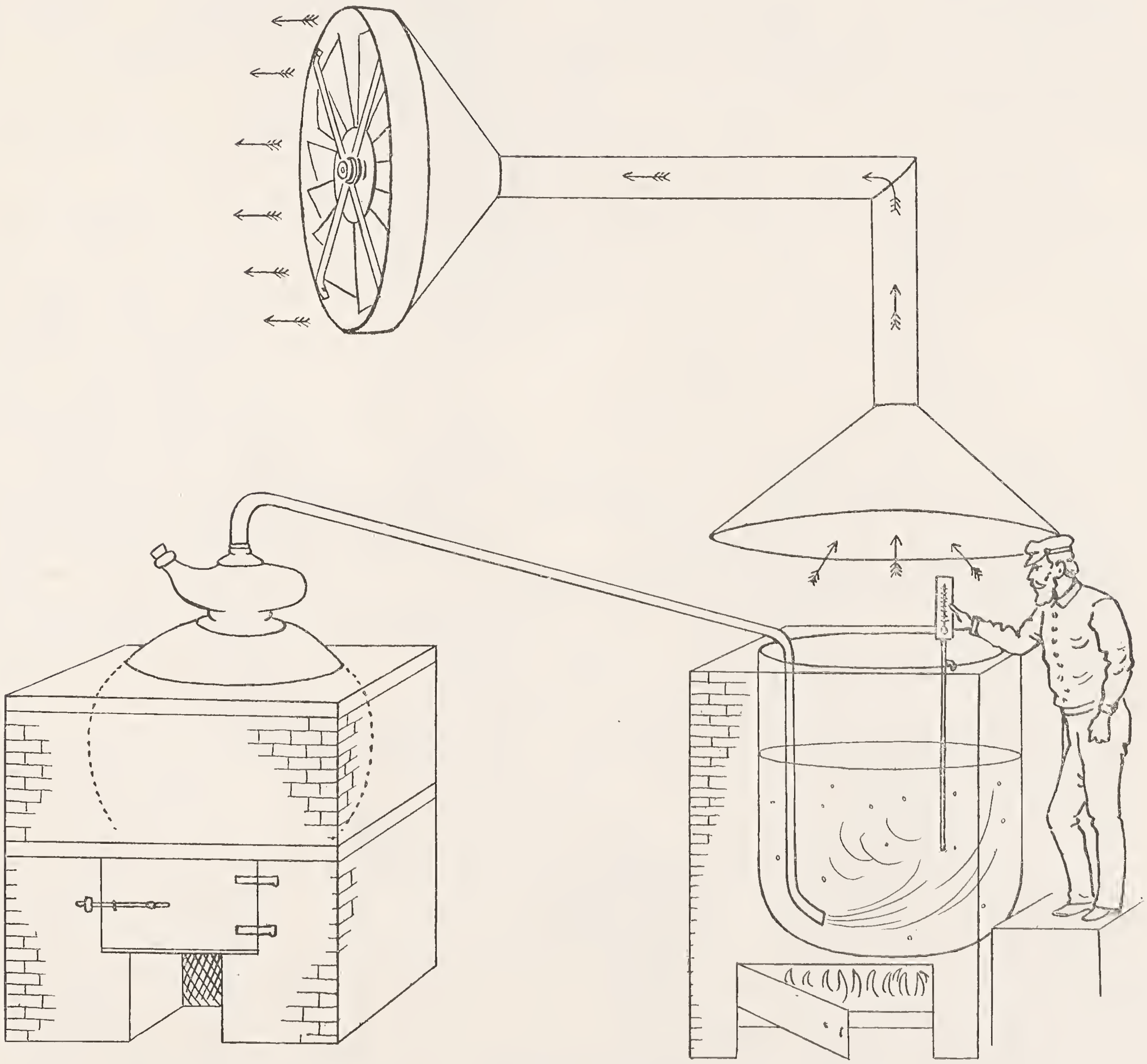
It may be seen at this moment that there has been a quantity quite large of oxygen absorbed by the oil.

The color of the oil has not changed at all. Day after a film can be noticed on the surface of the oil. Spread over a piece of glass, a sample of this oil will dry partially in less than 9 hours.

A second operation, if repeated exactly as the first one already described, will increase notably the proportion of oxygen absorbed by the oil; this will dry superficially, without solidifying, in less than 9 hours. The color of the oil after this second treatment will remain unchanged.

For use in making Varnishes, the prepared oil having been experimented with was a surprise to the operator; instead of working as it was expected, or at least as well as a Borate of Manganese oil oxidized to the same extent, it could not stand a temperature of 480 deg. F. without "BREAKING", in view of which fact the next experiments were made as per description hereafter.

#1360. The very same experiment having been conducted exactly in the same manner, but in place of ordinary Linseed Oil, bleached or refined Linseed Oil was put in the kettle, the result was a much more rapid absorption of oxygen and in a larger quantity.



Applied on a piece of glass, it produced a film in 8 hours; and submitted to the action of heat, it stood without "BREAKING" a temperature of 600 deg. F. in anordinary kettle.

IMPROVEMENT OF THE PURE OXYGEN GAS OXIDIZING PROCESS OF LINSEED OIL AT A COMPARATIVELY LOW TEMPERATURE. OXIDIZING A BLEACHED OR REFINED LINSEED OIL BY THE DIRECT ACTION OF OXYGEN GAS.

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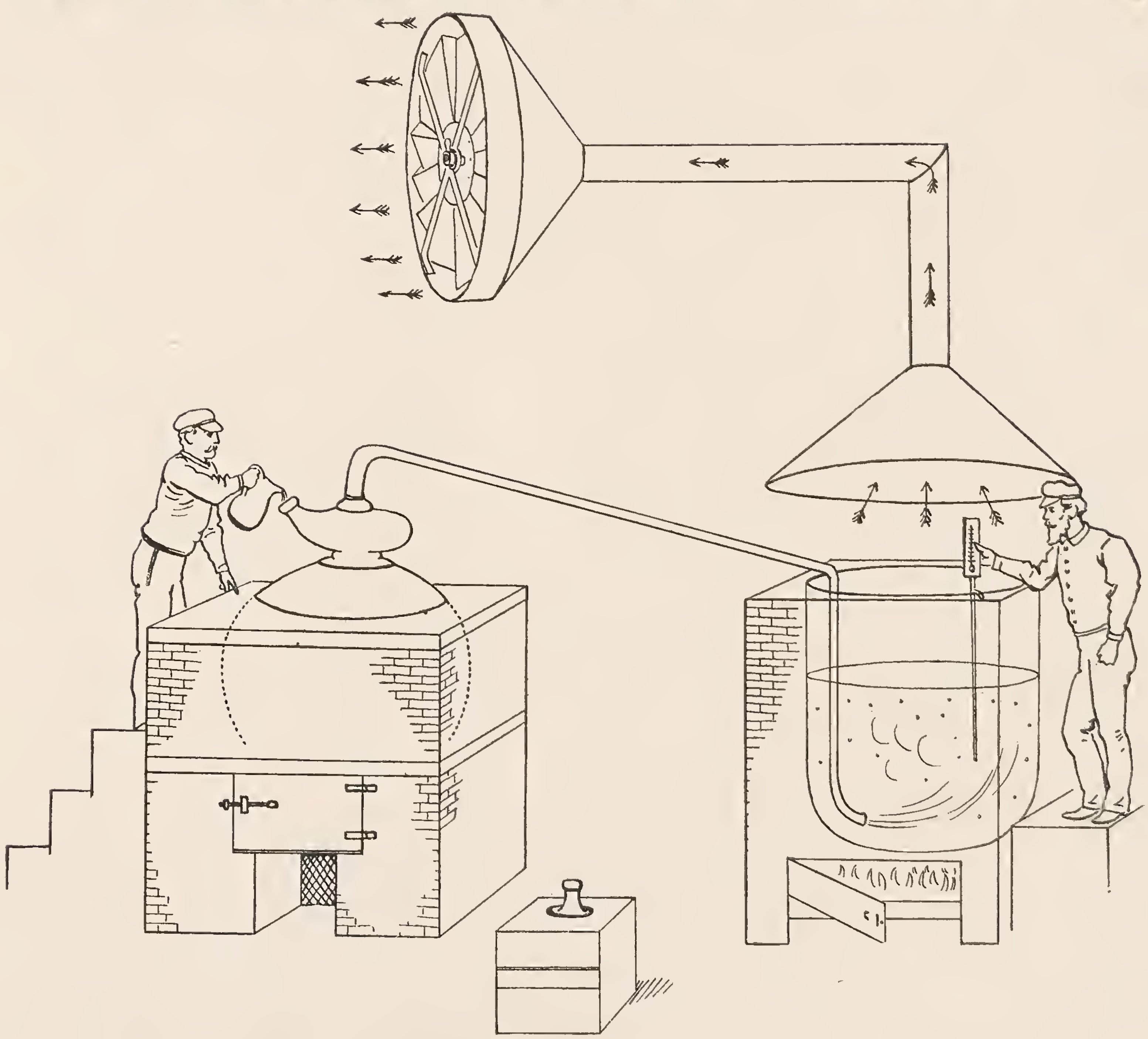
#1370. The Peroxide of Manganese MnO^2, used in the

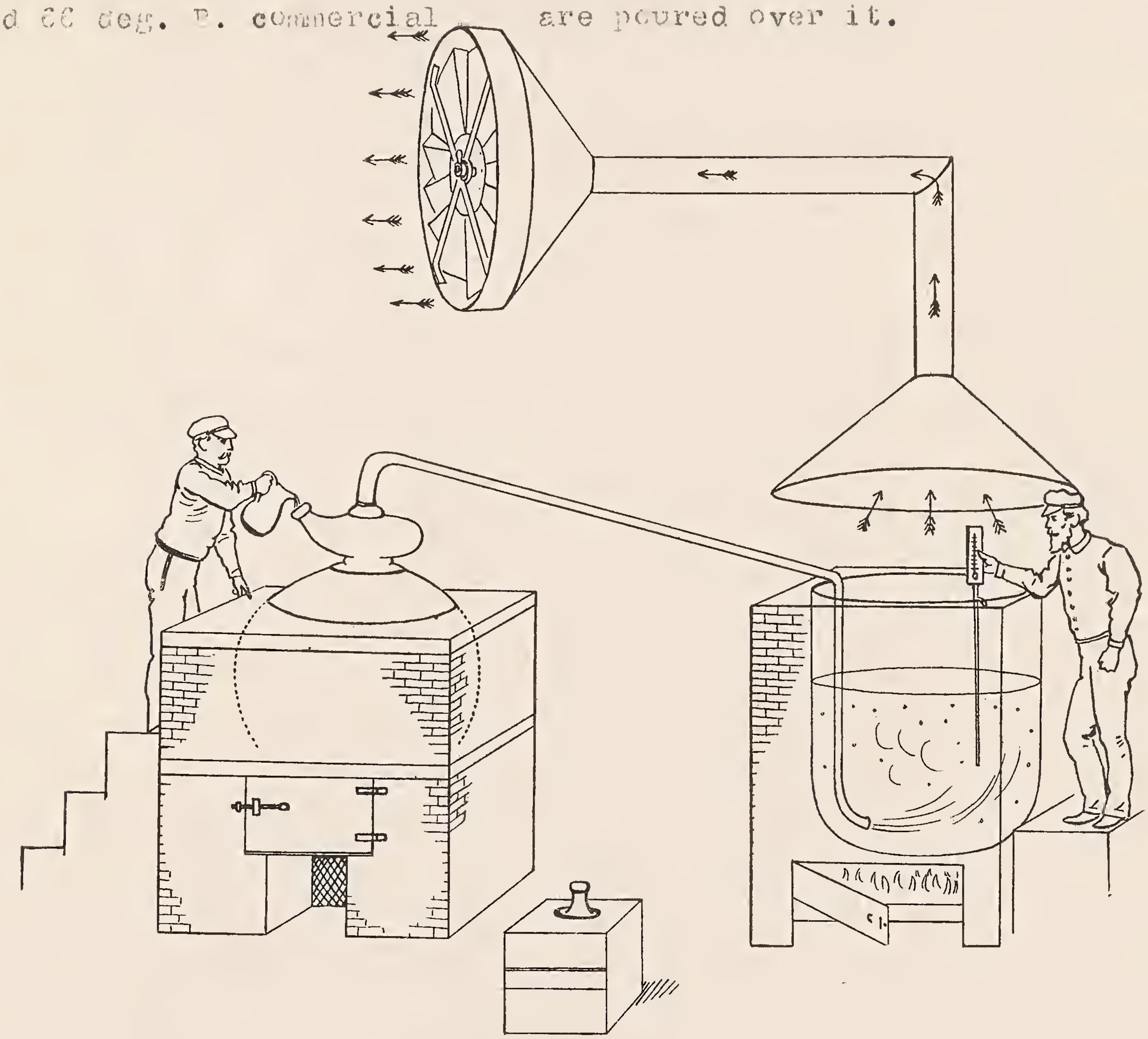


previous operation, is an indifferent body; but there is another Manganese Oxide, the Protoxide MnO, which is an energetic base. Sulphuric Acid combines with it, and the following reaction is produced.

$$MnO^2 + SO^3, HO = MnO, SO^3 + HO + O.$$

On this chemical reaction is based the preparation of oxygen to be used for oxidizing the bleached oil.

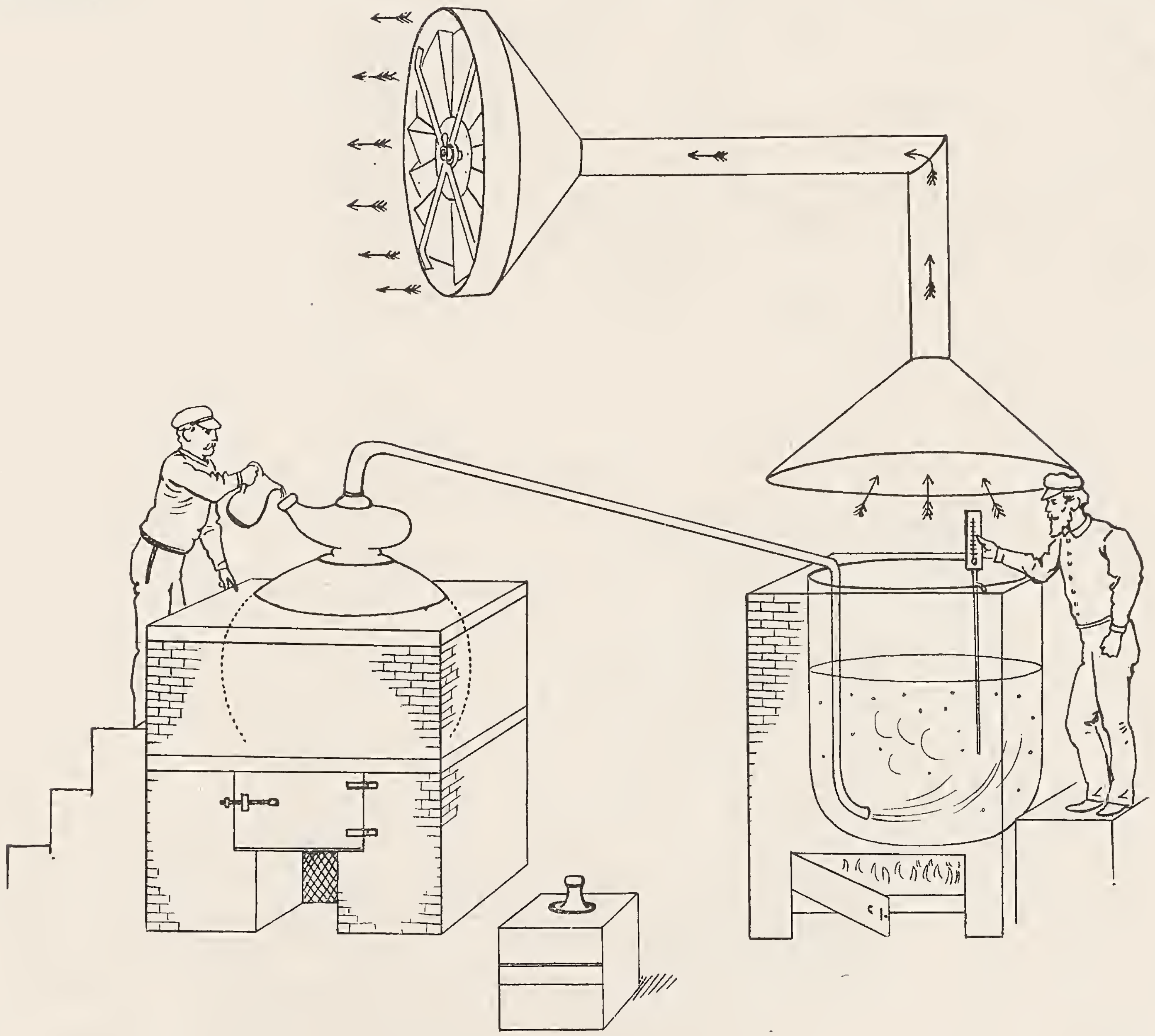
25 lbs. of Peroxide of Manganese are placed through the opening O inside of the retort of vessel V; then 12 lbs. of Sulphuric acid 66 deg. B. commercial are poured over it.



The opening O is then closed and the reaction at once takes place. The oxygen is conducted and distributed through the whole mass of the oil by the pipe P, the kettle is covered and the

oil distributed during about 10 hours through it at a temperature of 300 deg. F.

At this stage of the operation, all the oxygen produced by the Manganese Oxide has been freed, and about 60% of it has been absorbed by the bleached oil, which is now intensely oxidized without darkening.



The color of the oil is now fully as clear as it was at the beginning of the operation. As to its drying property, it is not yet equal to that of a lead oil, but favorably compares with that of a Borate of Manganese Oil.

COMBINED ACTION OF A DIRECT CURRENT OF OXYGEN GAS

and

OF BORATE OF MANGANESE ON LINSEED OIL.

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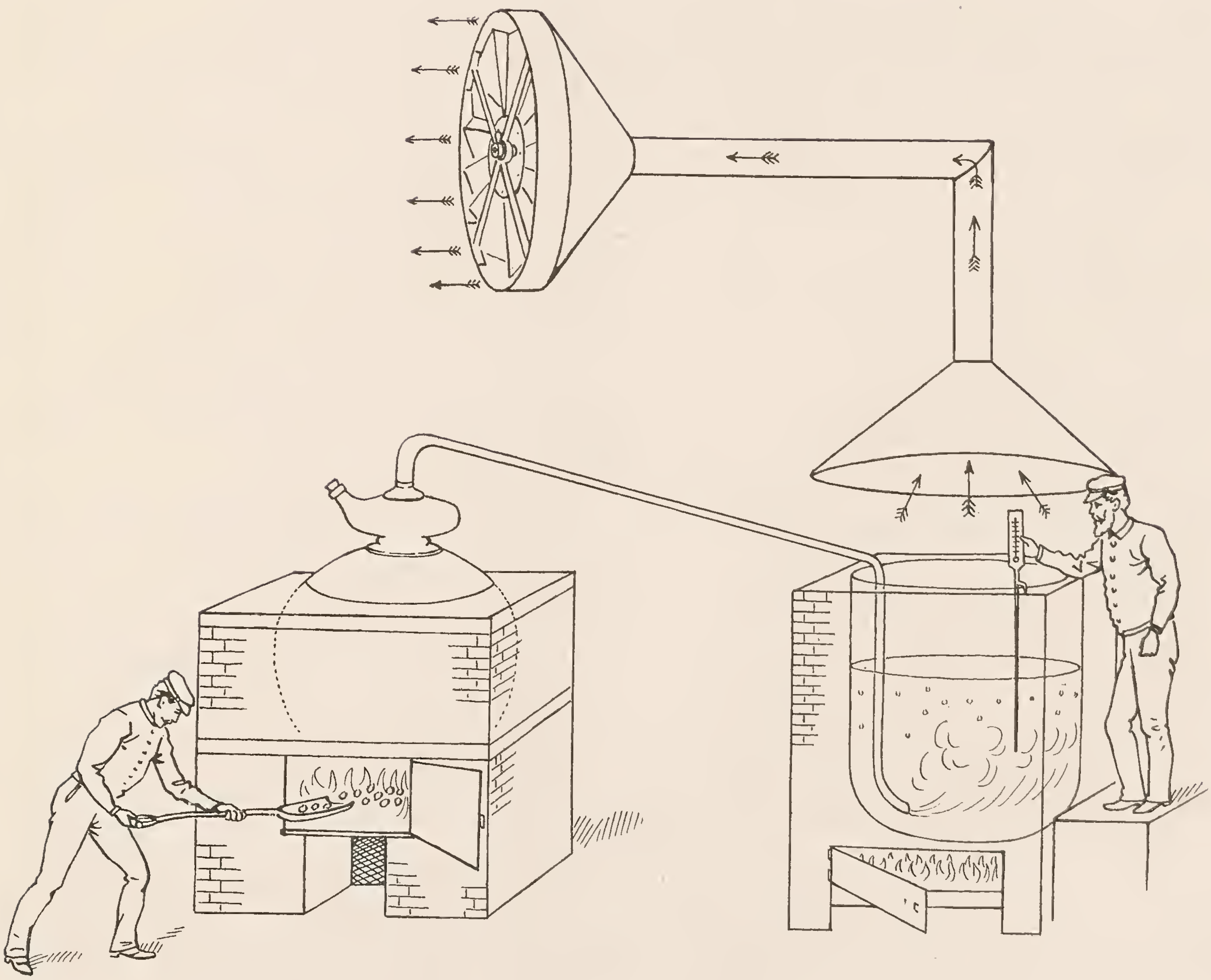
15[illegible]. Under the most favorable circumstances, Linseed



Oil can absorb oxygen to the enormous extent of 11 to 12% of its weight. During the oxidation of Linseed Oil, the small quantity of olein it contains remains unoxidized, and its presence confers elasticity upon the product.

The drying power of a light prepared oil or of a Varnish oil can be increased to a far greater extent. In fact, it is possible to make a light Varnish oil drying almost as rapidly as a lead oil and without turning dark, by the combined action of Borate of Manganese and a current of oxygen produced as per process already described.

The operation is conducted as per instructions already given; and while the current of oxygen gas produces a direct oxidation of the oil heated at 300 deg. F. in the kettle, the Borate of Manganese is incorporated in the meantime with the same oil, in the same manner as per process for making the ordinary Manganese Oil by the use of Borate of Manganese.

By using this, there is first the pure oxygen gas which is absorbed directly by the oil; furthermore, there is the additional effect of Borate of Manganese acting also as a powerful oxidizing agent.

#1390. The resulting prepared oil is the "Quickest Drying" Varnish oil which can be produced without affecting the original color of refined Linseed Oil.

It can be used for the preparation of superior Varnishes; also in "Quick Rubbing", "Medium Rubbing", "Flowing", and especially in Varnishes which must combine a "Quick Drying" property with a very light color.

PART No. XIV

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF THINNING DOWN VARNISHES.

Part No. XIV.

QUESTIONS OF THINNING DOWN.

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QUESTIONS OF THINNING DOWN.

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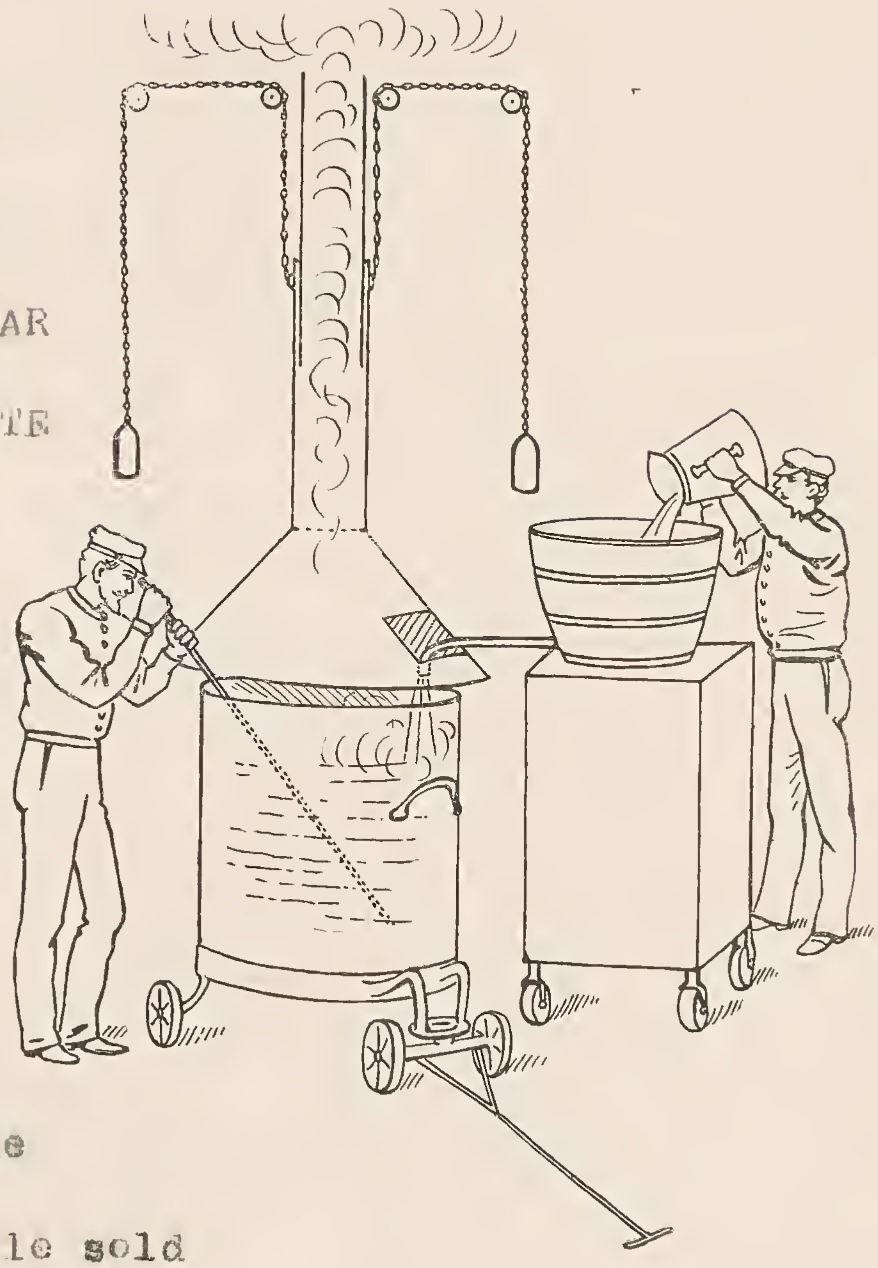
1400. According to the purpose for which a Varnish is intended, it should be thinned down more or less with the ordinary diluents.

The degree of fluidity or consistency of a Varnish depends naturally on the amount of thinners used for diluting the melted gums, the heavy oil or the oxidizing compounds which have been cooked together right in the copper kettle, according to the instructions of the process and the proportions of the formula.

If instead of using in the manufacture of Fat Varnishes, COMMON RAW LINSEED OIL, CALCUTTA LINSEED OIL or REFINED and BLEACHED LINSEED OIL, the Varnish maker has made use of ARTIFICIALLY THICKENED LINSEED OIL, the amount of thinners necessary to impart a proper consistency to the finished product will then be greater; the price of the Varnish in this case would be less, but the wearing properties will be decreased accordingly.

#1410. Operative Varnish makers do not agree as to what is the exact proportion of Turpentine or Naphtha which is to be used as a thinner or diluent even in the production of standard Varnishes; and this is one of the most important causes of not finding two brands of Varnish alike, although they may be sold under the same denomination.

For instance, certain Varnish makers are of the opinion that a WEARING BODY ZANZIBAR VARNISH made from 100 lbs. of ZANZIBAR PALE A and 18 gals. of LIGHT BORATE PREPARED OIL, should be thinned down with only 18 gals. of Turpentine; while other authorities in Varnish making maintain the opinion that for the same amount of Zanzibar gum, 36 gals. of oil are necessary to insure the WEAR which characterizes an article sold under the denomination of WEARING BODY VARNISH.



It is evident that the WEAR of a Varnish depends mostly on the amount of Linseed Oil which it contains; but it is not less true that the relation which exists between the gum, the oil and

the thinner in a standard Varnish, such as WEARING BODY, must regulate the thinning down to a proportion that experience indicates as being a correct one.

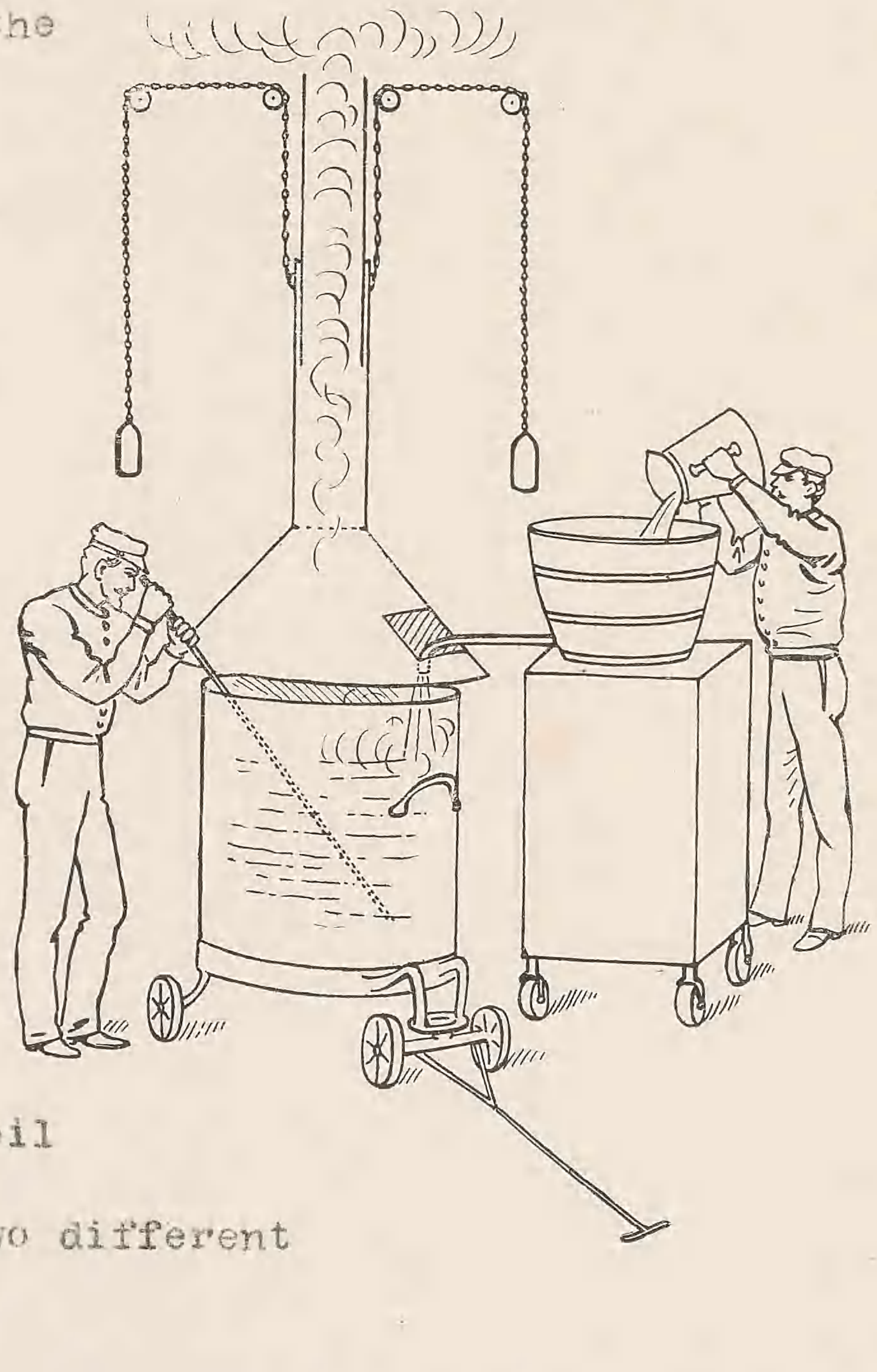
"1420. Beyond the proportion of 55 gals. of PREPARED OIL to 100 lbs. of a HARD GUM, the resulting product thinned down accordingly, hardly deserves the name of a Varnish. It is more of the nature of an oil; or in other words, there is not enough hard gum in it to insure the gloss, brilliancy or finish, which is the first characteristic of a coating deserving the name of Varnish.

In QUICK RUBBING VARNISHES, what is expected first is quick drying and then a hardness sufficient to permit after 24 hours the operation of pumicing, sand-papering or rubbing without removing the resinous part, so as to get a well prepared ground or a perfectly smooth surface upon which another coat will impart a fine Varnish.

Consequently, three causes will contribute to this result: First, a large proportion of hard gum; second, a small proportion

of oil; third, a comparatively large proportion of diluents.

Some Varnish makers, for instance, call QUICK RUBBING VARNISH a preparation made of only 6 gals. of oil per every 100 lbs. of ZANZIBAR or KAURI GUM, diluted with 25 gals. of TURPENTINE or NAPHTHA. Others believe that it is a wrong policy to insure the quick drying through an increase of the diluents; and they have adopted in preference, as being the best formula, the proportion of 20 gals. of DILUENTS for a Quick Rubbing Varnish made of 100 lbs. of ZANZIBAR, BENGUELA or SIERRA LEONE and 6 gals. of PREPARED OIL.

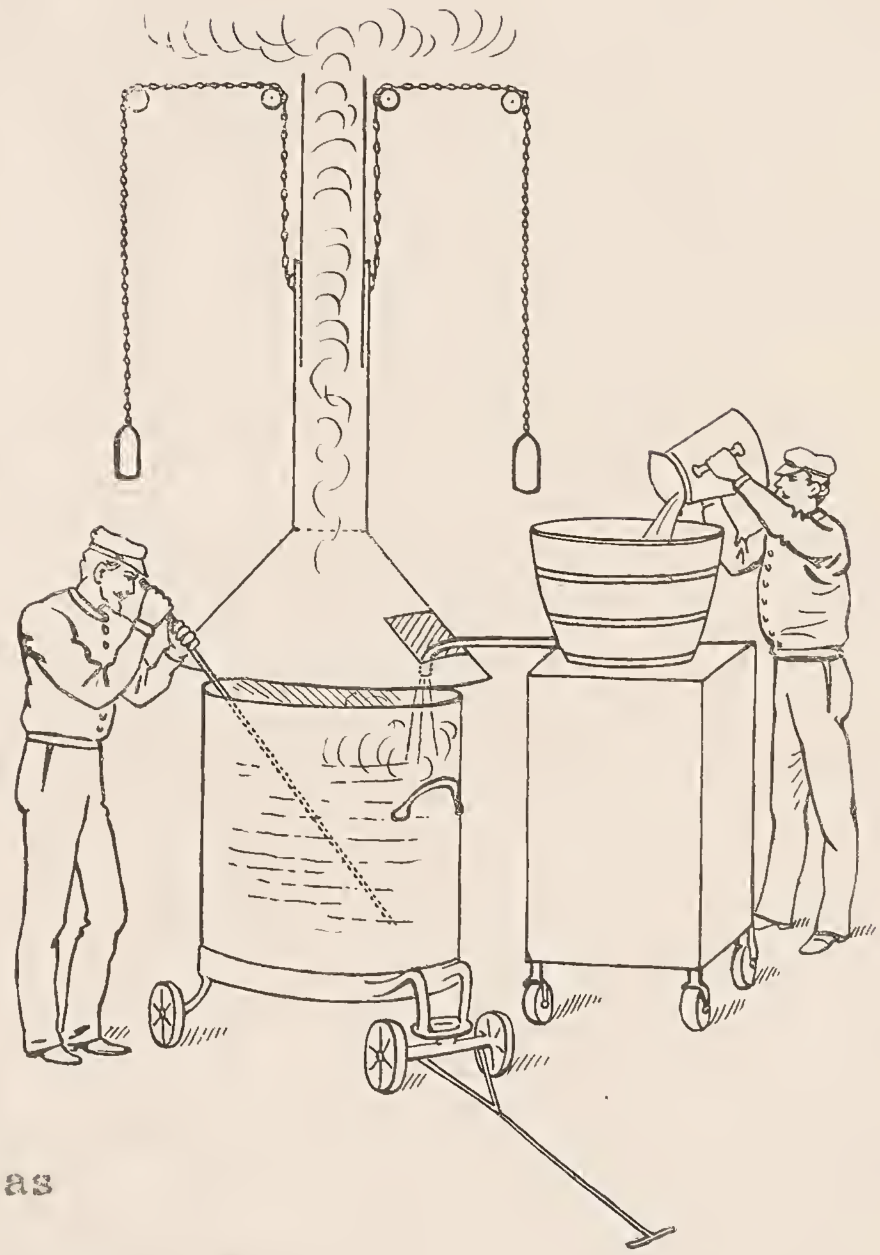


#1430. What is called HEAVY GEAR VARNISH is also a standard preparation placed in the market by every Varnish maker; still, the proportion of oil could not be found the same in two different brands compared together.

Some Varnish makers suppose and have their reasons for supposing that a proportion of 16 gals. of oil to every 100 lbs. of gum will give a most satisfactory result; while the writer has had many occasions to find in samples of HEAVY GEAR of the best

makes, the proportion of 18 and sometimes 20 gals. of oil per 100 lbs. of gum; and in other instances, the proportion of only 12 to 14 gallons.

From the above, it may be seen that what is called the "STANDARD" in a Varnish extensively used is a word only applicable to a product which is made in such a way that the proportion of ingredients is the correct one for certain requirements; but it may happen that the same proportion is not adequate to other requirements that Varnish makers must have also in view.



For the above reasons, a mere formula giving only proportions is of very little value to a Varnish maker, unless it is combined with instructions as to the peculiar requirements that such a formula will fulfill when the Varnish will be applied.

The operation of thinning down is therefore subject to certain rules that the nature of the Varnish, or better said, the finished product, must regulate according to its applications.

PART No. XV

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF FILTERING AND CLARIFYING VARNISHES.

Part No. XV.

Q U E S T I O N S O F

FILTERING AND CLARIFYING VARNISHES AND PREPARED OILS.

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REMARKS CONCERNING THE OLD
and the
IMPROVED METHODS OF RAPIDLY FILTERING AND CLARIFYING VARNISHES.

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#1500. It is a fact well known in Varnish making, that nothing but age can give the BODY, TOUGHNESS and at the same time the TRANSPARENCY required from a faultless oil or Varnish.

By allowing an oil or a Varnish to stand undisturbed in tank in a room heated at a uniform temperature for a certain period, all the impurities, insoluble matter, inert materials, resinous, gummy and mucilaginous substances settle at the bottom, producing a thick residue commonly named "FOOTS". The Varnish or the oil is thus clarified, and the BODY increases according to the time the Varnish has been allowed to stand undisturbed and settle.

It is not always possible to allow a prepared oil or a Varnish to stand undisturbed for a long period in the tank after it has been made, three months at least being necessary to separate the undesirable part of a Varnish by this method; the use of filtering apparatuses capable of accomplishing the same result in a short time constitute not only an improvement but a great saving especially in the production of common grade Varnishes, made in large quantities at a time and sold at a very low price.

ABOUT THE USE OF FILTER PRESSES IN CLARIFYING VARNISHES THROUGH CLOTH, PAPER OR BOTH. Remarks concerning the double action pump.

IMPORTANCE OF A UNIFORM PRESSURE IN FILTERING VARNISHES.

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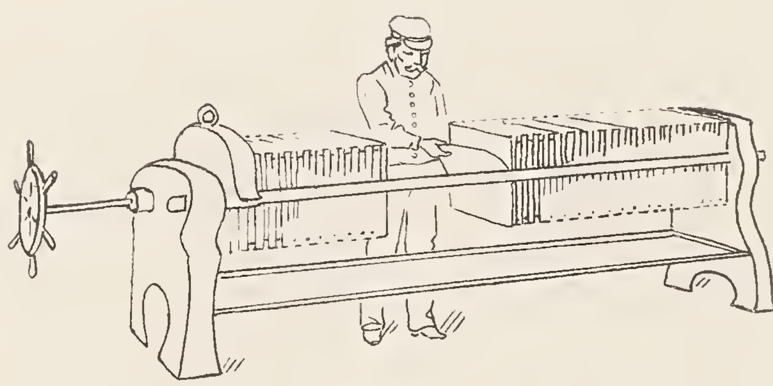
#1510. The filter press is certainly an excellent apparatus to use in clarifying Varnishes; but its management requires a great deal of experience, especially in Quick Drying Varnishes, Dryers and Rosin preparations.



When there is a single or double action pump connected with the filter press, the pump should work very slowly at a pressure not too high, and the pressure should always be distributed as evenly as possible on the whole filtering surface inside of the filter press.

Sudden jerks from the pump are to be avoided; and when it is necessary to filter a Varnish drying very quickly, it is often preferable not to use the pump at all.

Very fine results in rapidly filtering and clarifying Varnishes can be obtained through hydraulic pressure, as follows:

FILTERING AN OIL OR VARNISH

through

A Filter Press, without using the pump.

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#1520. A varnish or an oil can be perfectly clarified and filtered through a filter press without using a pump. In this case, all sudden jerks are entirely avoided and the pressure is rendered uniform by an arrangement as per cut.

A large vat in which 1000 gals., more or less, of the Varnish to be filtered have been placed, is standing on a platform built at 15 to 20 feet above the filter press.

The Varnish is sent to the filter by opening faucets F and F; but an arrangement such as this is not always possible; it requires a great deal of space, and this is quite an objection in Varnish factories. The pump is the best adjunct to economize space, and a perfect filtering can be done with it providing it produces an even pressure on the whole filtering surface inside the press. Special pumps are built to that effect.

REASONS WHY A VARNISH OR A VARNISH OIL MUST NEVER BE SENT TO THE FILTER PRESS UNTIL COLD.

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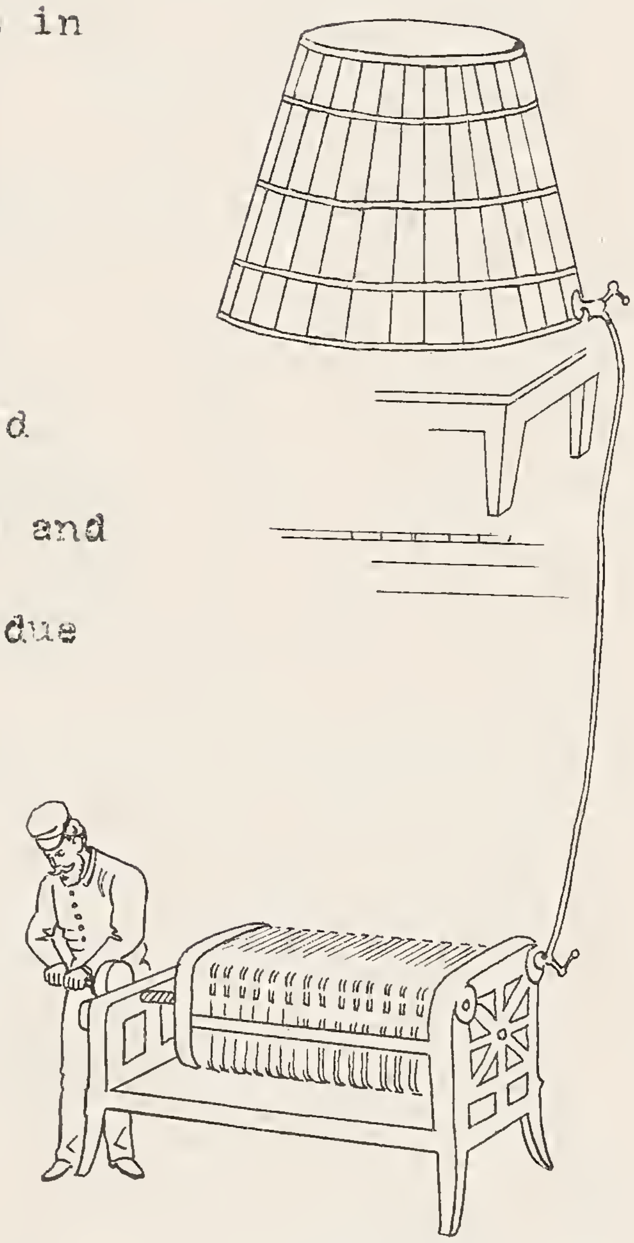
#1530. Varnish must always be filtered cold; also Linseed Oil or Prepared oils; and the reason for this is very simple.

There are in Varnishes, as well as in Linseed Oil, some fatty substances soluble entirely at a temperature above 150 deg. F., but the same substances are insoluble at an ordinary temperature; and if allowed to stand undisturbed for a week or two, they separate and settle, producing at the bottom a thick residue called "FOOTS".



When a Varnish or Prepared Oil is filtered warm, the residue of organic matters above mentioned passes in the state of solution through the thickest felt, cloth or paper; then in cooling, this soluble residue solidifies and gradually settles, just as if no filtering had been performed. Consequently, a Varnish or a Varnish Oil must be filtered only when cold; that is, at the same temperature as that of the air.

ABOUT THE SELECTION AND BEST DISPOSITION OF THE FILTERING CLOTH AND PAPER BETWEEN THE FRAMES OF THE FILTER PRESS.

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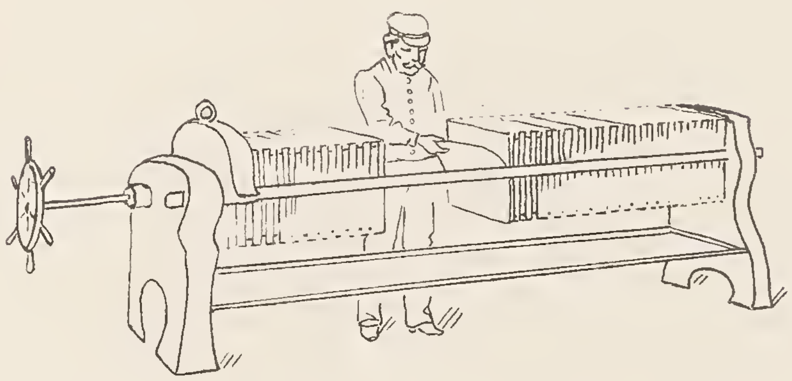
1540. The filtering of Varnishes and prepared oils is made through cloth, felt or paper.

The best arrangement to have is a combination of filtering paper and a cloth underneath. There is a very thick paper, expressly manufactured for the purpose of filtering Varnishes.



This paper should be dipped in Turpentine or Naphtha just before placing it between the chambers of the filter press; the Naphtha opens the pores and renders it similar to felt.

In this condition, a very small pressure will be sufficient to insure the filtering.

The reason why I advise to use both paper and cloth is that I have found this combination to produce a more perfect clarifying, the cloth underneath preventing the filtering paper from breaking when the pressure is too high. The resisting power of the filtering surface is thus insured.

HOW OFTEN TO CHANGE THE FILTERING PAPER.

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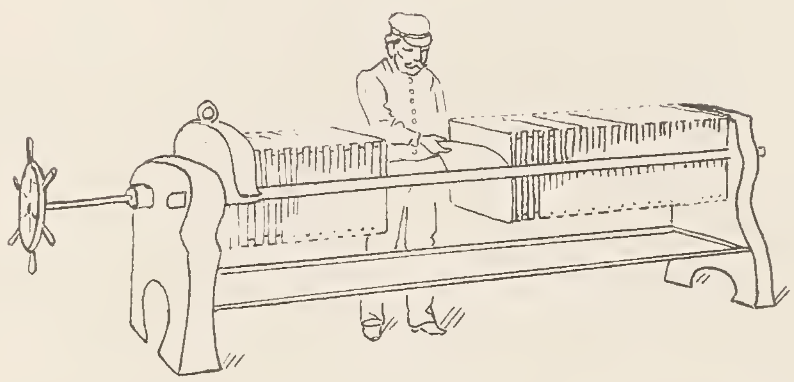
"1550. When there are several filter presses in use in a Varnish factory and a continuous filtering is done all day, the filter presses can be allowed to remain idle over night without the necessity of changing the filtering paper the day after.

But when more than twelve hours elapse between two operations, the filtering paper must be changed on account of the Var-



nish filling the pores of the paper and rendering it unfit for use when saturated with Varnish that has been allowed to dry.

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SMALL HAND PRESSES FOR EXPERIMENTS ON A SMALL SCALE.

Hand Presses can be used as successfully as steam filter presses; and for experimental work a small press worked by a hand pump will be found a very useful adjunct to the Varnish maker's Laboratory and experimenting department.

HOW TO CLEANSE A FILTER PRESS
WHEN A DIFFERENT SORT OF VARNISH IS TO BE FILTERED.

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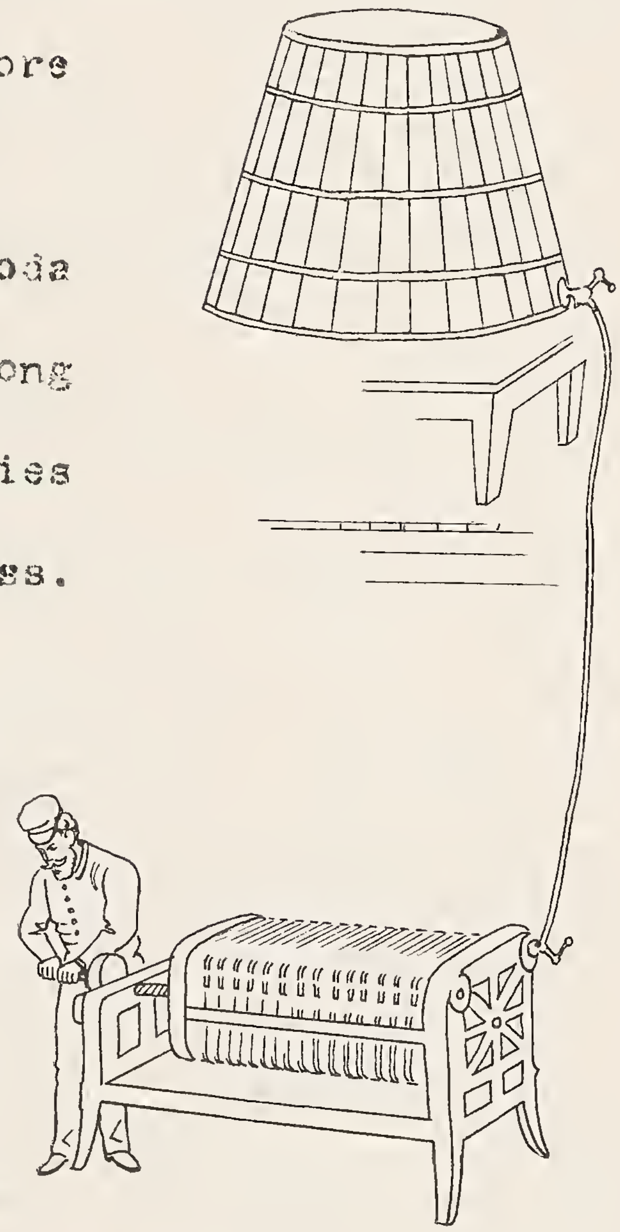
#1560. A perfect cleansing of the filter press used in clarifying Varnishes can be done either with Benzine or Turpentine passing through the whole apparatus; but this is rather an expensive method. A more economical one that also gives good results consists in dissolving 50 lbs. of Caustic Soda in 20 gals. of hot water, and using this strong alkaline solution. This softens and saponifies the hard Varnish which may remain in the press.



After the filter press has been cleaned with alkali, a good flow of clear water should be sent through the apparatus for about 15 minutes, so as to wash equally well the pump and the filter.

Then the apparatus must be allowed to dry perfectly before any filtering is performed again.

A thorough cleansing of the filter press is a very tedious operation, which can be avoided by following the instructions hereafter given.

HOW TO DO AWAY WITH THE TEDIOUS WORK OF CLEANSING THE FILTER PRESS AFTER EACH OPERATION OF FILTERING VARNISHES.

INSTRUCTIONS FOR SAVING TIME AND LABOR.

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#1570. The work of cleansing thoroughly a filter press and changing the filtering paper is a long and tedious operation which requires two workmen, and therefore is very expensive.

The following method, which is the result of many years experience, will prove very useful to Varnish makers using Filter Presses for clarifying.

Instead of placing one sheet of paper at a time on each frame of the filter press, place no less than eight or ten. It will take no longer time to do this than to place one sheet. The object of using so many sheets is not to improve the filtering; if the filtering paper is of good quality, the Varnish or Oil will filter fully as well through a single sheet as it will through 8 or 10; but where the advantage of this method will be realized is between two operations of filtering.

If 8 or 10 sheets of filtering paper have been placed instead of one, the next operation will find the filter press in readiness by simply taking out and throwing away the soiled sheet, which carries with it all the residue, while the nine remaining sheets are ready to perform nine more operations.

#1580.

IMPROVED PROCESS FOR RAPIDLY FILTERING OILS AND VARNISHES so as to make a "BATCH" of prepared oil or Varnish in the morning AND SHIP IT ON THE SAME DAY PERFECTLY CLARIFIED.

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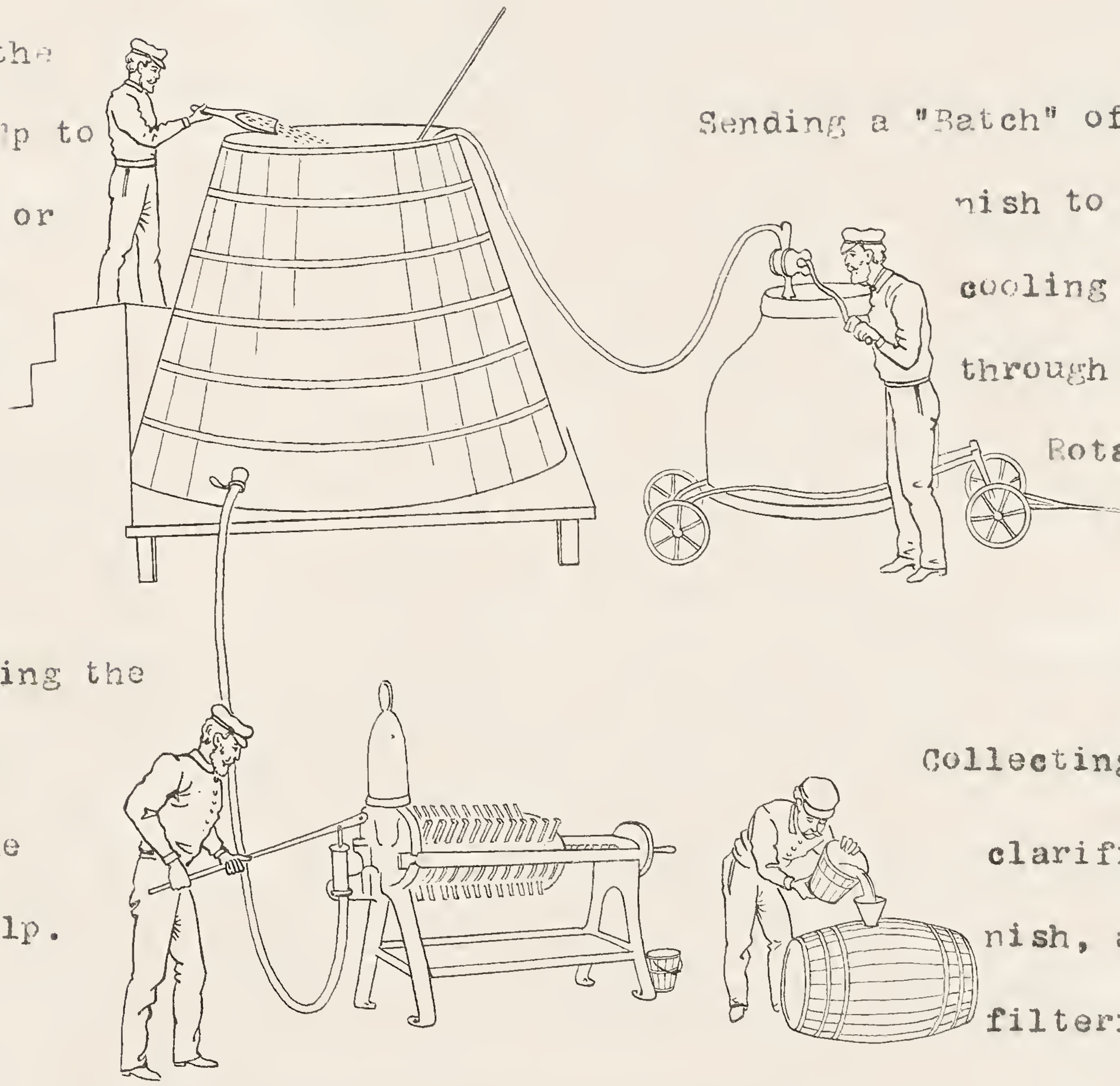

Adding the Wood Pulp to the oil or Varnish freshly made.

Sending a "Batch" of Varnish to the cooling vat through the Rotary Pump.

Separating the Varnish from the Wood Pulp.

Collecting the clarified Varnish, after filtering it.

Through the combined use of neutralized wood pulp and a good filter press, as per method plainly described above, it becomes possible to make a "BATCH" of Varnish in the morning and ship it on the very same day, perfectly clarified.

HOW TO CLARIFY A CLOUDY VARNISH.

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#1585. When a Varnish remains cloudy or specky after having been filtered once, it often becomes necessary to repeat the filtering once more through the filter press. But it may happen that a Varnish remains cloudy or specky after two, three or four filtering operations. The fault in this case is not with the filter press, but only with the Varnish; and a special method of filtering is then resorted to.

This method is based upon the peculiar property of certain minerals reduced to impalpable powder, and vegetable substances reduced to Wood Pulp, to take hold of all the resinous or fatty substances and impurities which remain in suspension in the Varnish and precipitate them at the bottom, thus leaving the Varnish or the prepared oil so treated perfectly clarified and free from specks.

The mineral substances presenting these peculiarities are ANIMAL BLACK, FULLER'S EARTH and GROUND GLASS.

The best vegetable substance is poplar wood pulp, previously neutralized through repeated washings in a strong alkaline solution so as to eliminate the resinous substances of the wood which could be dissolved in Linseed Oil, Turpentine or Naphtha. The process of clarifying a cloudy Varnish should be conducted thus:

WOOD PULP PROCESS OF CLARIFYING A CLOUDY VARNISH.

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#1590. To clarify a cloudy Varnish, you must operate thus:

Spread over the surface of the Varnish in the tank, 1 lb. of Wood Pulp to every 100 gals. of Varnish that you propose to clarify. Then use a wooden stirrer and mix the Wood Pulp and Varnish thoroughly together. When the pulp will be thoroughly soaked into the Varnish, its volume will increase almost like that of a sponge.

Allow the wood pulp to remain in the Varnish for an hour or two, which time will be amply sufficient for the pulp to absorb or take hold of the specks, mucilage, fatty substances or impurities. Then, in order to separate the fluid or Varnish from the solid or pulp, send the whole mixture, Varnish and pulp, to the filter press, with or without the use of a pump.

The wood pulp will be stopped by the filtering paper between the chambers of the filter press, forming a thick layer like a vegetable felt, through which layer the Varnish will be filtered and clarified; and rendered, not as clear, but as bright as Glycerine.

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PART No. XVI

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF COLORATIONS.

NATURAL AND ARTIFICIAL COLORING OF OILS AND VARNISHES.

Part No. XVI.

QUESTIONS OF COLORATIONS.

NATURAL AND ARTIFICIAL COLORING OF OILS AND VARNISHES.

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QUESTIONS OF COLORATIONS.

NATURAL AND ARTIFICIAL COLORING OF OILS AND VARNISHES.

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#1600. With only very few exceptions, "FAT VARNISHES" must be TRANSPARENT and COLORLESS as much as possible, so as not to change the original color of the ground or surface upon which they are applied.

There are, however, "FAT VARNISHES" in which a coloring is needed; for instance, BLACK RUBBING, BLUE LEATHER VARNISH, GILDER'S VARNISH and HARD OIL FINISHES.

In the manufacture of VARNISH ENAMELS, the addition of a pigment is necessary to produce the desired color. In the manufacture of LACQUERS, OIL FINISHES and VARNISH STAINS, the addition of soluble colorings is necessary to produce SPECIAL TONES.

The coloring substances of interest to the Varnish maker are therefore either completely insoluble in all sorts of vehicles or:

Soluble in - - - - Linseed Oil.
" " - - - - Turpentine or Naphtha.
" " - - - - Alcohol.
" " - - - - A melted resin or gum.

BUT NEVER SOLUBLE IN - - WATER.

#1610.

TABLE SHOWING COMPARATIVELY

the

COLORING SUBSTANCES

SOLUBLE IN LINSEED OIL, BENZINE, TURPENTINE OR ALCOHOL.

NAME OF THE MATERIAL.	Linseed Oil.	Turp. or Benzine.	Alcohol.	Water.	Color produced.
VARNISH BLUE,	Insol.	Insol.	Insol.	Insol.	DARK BLUE.
ASPHALTUM,	Sol.	Sol.	Insol.	Insol.	WALNUT.
BLACK PITCH,	Sol.	Sol.	Insol.	Insol.	GOLD.
ALKANET,	Partly,	Insol.	Sol.	Insol.	DARK RED.
TURMERIC,	Insol.	Insol.	Sol.	Insol.	L. YELLOW.
DRAGON BLOOD,	Insol.	Insol.	Sol.	Insol.	BLOOD.
GAMBODGE,	Insol.	Insol.	Partly,	Sol.	GOLD.
SCHEEL-LAC,	Insol.	Insol.	Sol.	Insol.	ORANGE.
LAMP BLACK,	Insol.	Insol.	Insol.	Insol.	BLACK.
SPIRIT RED,	Partly,	Insol.	Sol.	Insol.	RED.
SPIRIT BLUE,	Partly,	Insol.	Sol.	Insol.	LIGHT BLUE.
SPIRIT GREEN,	Partly,	Partly,	Sol.	Insol.	L. GREEN.
SPIRIT BLACK	Partly,	Insol.	Sol.	Insol.	BLUE BLACK.
SPIRIT YELLOW,	Partly,	Insol.	Sol.	Insol.	DEEP YELLOW
SPIRIT BROWN,	Insol.	Insol.	Sol.	Insol.	BROWN.

NAME OF THE MATERIAL.	Linseed Oil.	Turp. or Benzine.	Alcohol.	Water.	Color produced.
SPIRIT ORANGE,	Insol.	Insol.	Sol.	Insol.	ORANGE.
OIL GREEN,	Sol.	Partly,	Partly,	Partly,	GREEN.
" MAROON,	Sol.	Partly,	Partly,	Partly,	MAROON.
" ORANGE,	Sol.	Insol.	Partly,	Insol.	ORANGE.
" VIOLET,	Sol.	Partly,	Partly,	Insol.	PURPLE.
" BLACK,	Sol.	Partly,	Partly,	Insol.	BLUE BLACK.
" YELLOW,	Sol.	Sol.	Partly,	Partly,	GOLD.
SPIRIT OAK,	Partly,	Insol.	Sol.	Insol.	OAK.
" MAHOGANY,	Insol.	Insol.	Sol.	Insol.	MAHOGANY.
" CHERRY,	Insol.	Insol.	Sol.	Insol.	CHERRY.
" WALNUT,	Insol.	Insol.	Sol.	Insol.	WALNUT.
" EBONY,	Insol.	Insol.	Sol.	Insol.	EBONY.
WATER OAK,	Partly,	Insol.	Insol.	Sol.	OAK.
" MAHOGANY,	Partly,	Insol.	Insol.	Sol.	MAHOGANY.
" CHERRY,	Partly,	Insol.	Insol.	Sol.	CHERRY.
" WALNUT,	Insol.	Insol.	Insol.	Sol.	WALNUT.
" EBONY,	Insol.	Insol.	Insol.	Sol.	EBONY.

From the above table, it may be seen that any tint or color can be imparted to the whole range of vehicles, solvents or diluents for the production of OIL FINISHES, VARNISH STAINS, WATER STAINS or LACQUERS by the use of an adequate coloring.

INSTRUCTIONS CONCERNING THE USES AND APPLICATIONS

of

ALL THE COLORING SUBSTANCES INTERESTING THE VARNISH MAKER.

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#1620. In the foregoing table, which shows comparatively all the coloring substances used in Varnish making, mention has been made of only those materials which are in daily use for tinting or coloring an oil, a spirit, an alcohol or a menstruum. In Chapter XIII of the "ART OF VARNISH MAKING", full particulars are given as to how to prepare the colorings so as to apply them to the best advantage.

VARNISH BLUE . . . is a superior grade of Prussian Blue sold under the name of either "BRONZE BLUE" or "CHINESE BLUE DEEP". This pigment is used in making

#1625. BLUE LACQUER for tin cans, and also for making PATENT LEATHER BLUE ENAMEL VARNISH. Used in a small proportion, it imparts a bluish, velvety color to Lamp Black, thus producing Blue Black.

LAMP BLACK . . . . is used in the manufacture of BLACK RUBBING, either alone or mixed with a very small proportion of VARNISH BLUE.

ASPHALTUM . . . . . The great coloring power of Asphaltum is utilized for making oils or Varnish Stains in almost any color ranging from deep Walnut to light gold. The Walnut color is the result of a plain solution of Asphaltum either in oil or in Benzine or Turpentine on any wood surface. The Gold color is the result of applying the same solution on white metals such as tin. The color can be made either lighter or darker according to the proportion of Asphaltum used.

BLACK PITCH . . . . has a darker coloring effect than Asphaltum. It is soluble in the same vehicles and used exactly as Asphaltum.

ALKANET ROOT . . . is a coloring substance from the vegetable kingdom; it is not soluble directly in Linseed

#1630. Oil, but after having been dissolved in alcohol, the alcoholic tincture will color Linseed Oil red.

GAMBODGE . . . . . Gives a beautiful gold yellow emulsion in water. As it dissolves with great difficultyin alcohol, a previous trratment is necessary for rendering it useful in making alcohol Lacquer.

TURMERIC . . . . . also called "Curcuma", is another coloring substance of vegetable nature which gives in alcohol a bright yellow color or tincture from which certain Yellow Lacquers are made.

There is a great objection against the use of Turmeric; its color is affected by light and fades out rapidly. For this reason, aniline colors have taken almost entirely the place of Turmeric.

SCHEEI-LAC . . . . is a proprietary name given to a resin gum extensively used as a substitute for Shellac. It is readily soluble in Grain or wood alcohol, fusel oil and acetone, producing in these sol-

#1635. vents a beautiful tincture of a dark orange color. This material being a resin gum, produces consequently a Varnish stain or Lacquer by simply dissolving it in alcohol.

DRAGON BLOOD . . . is another coloring substance soluble in alcohol to a great extent, and gives a very strong red color similar to that of blood.

ALIZARINE . . . . . is a comparatively new material for use in coloring. It produces tints perfectly fast.

ABOUT THE VERY LATEST
COLORING SUBSTANCES
OF MINERAL ORIGIN FOR USE IN VARNISH MAKING.

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#1040. In the foregoing table of coloring substances have been mentioned the very latest materials that have been discovered in the line of aniline colors.

Until not very long ago, two great objections were made against the use of aniline colors in Varnish making or in the production of Lacquers and varnish stains. The first objection was that Aniline colors were completely insoluble in Linseed Oil, Turpentine or Naphtha, and that Aniline colors soluble in water were too rapidly affected by the destructive action of light.

Owing to the recent discoveries made in the production of fast colors deriving from coal tar or aniline dyes, and the possibility of rendering them soluble in hot Linseed Oil, the above objections have been removed, and special aniline coloring substances have now taken the place, almost entirely, of all the vegetable colors previously used by the Varnish maker.

Under the name of "SPIRIT DYES", "OIL DYES" and "WOOD DYES", a very large concern in Hounslow, Middlesex, England, is manufacturing new colorings soluble in Linseed Oil, Benzine, Turpentine, alcohol and water, for special use in Varnish making.

ABOUT THE PROPORTIONS OF SOLUBLE COLORING SUBSTANCES
required for the production of
A GIVEN TINT OF VARNISH STAIN IMITATING NATURAL WOOD.

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7645. No matter what is the nature of the SOLUBLE COLORING SUBSTANCE used in the preparation of a stain, it will be impossible to give accurate proportions by weight of the dry coloring required for duplicating a given tint of colored wood. The operator must not lose sight of the fact that, for instance in the preparation of a MAHOGANY VARNISH STAIN, it is the color of the mahogany wood that is to be imitated and not somebody else's idea of what a mahogany color is or ought to be. However, it may happen that a competitor's brand of Mahogany Varnish stain is of interest enough to be considered as the standard in tone, in which case the operator willing to imitate a stain made in this way should proceed as follows:

In a steam jacketed kettle as per cut in the following page, put first 10 gals. of Turpentine; open the steam valve until the heat thus produced brings the temperature of the Turpentine up to 100 deg. F. At this moment turn off the steam and put into the kettle, very little at a time and under constant stirring, 2 lbs. of SOLUBLE OIL ORANGE COLOR.

Help the solution of the color by mixing constantly for about five to ten minutes. Then cover the kettle so as to avoid

volatilization of the Turpentine. The kettle having been covered, turn the steam on again. Bring the temperature to about 140 deg. F. Then uncover the kettle, mix for about 15 minutes, cover up again and allow the preparation to stand undisturbed until cold.

When cold, the result will be a highly concentrated tincture of an intense orange color. If there is no residue at the bottom, this will show that all the coloring substance has been taken up by the Turpentine. The concentrated orange tincture should be then removed with a scoop from the kettle and passed through a fine metallic sieve into a clean petroleum barrel standing on a platform, and allowed to stand undisturbed for about three days before using.

This TURPENTINE CONCENTRATED TINCTURE will be the coloring used in liquid form for bringing any fat Varnish or rosin preparation up to the color desired, from the lightest to the deepest orange. It is only a question of proportions. In this state, the liquid coloring will combine readily with cold Varnish, while the same result could not be obtained from the use of the dry coloring substance directly, as this would settle without dissolving.

HOW TO MANIPULATE THE TURPENTINE COLORING TINCTURES

for the production of

MAHOGANY, CHERRY, ROSEWOOD, WALNUT, OAK, EBONY OR OTHER NATURAL WOOD

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#1650. For the reasons already given in the previous page, the operator, after having selected his dry coloring substances soluble in Turpentine, should make a tincture of OIL YELLOW, OIL VIOLET, BLUE BLACK, OIL MAROON, of the same strength and in the same manner as already described in the previous page for preparing the concentrated Turpentine Orange Tincture. From these 5 tinctures, which after being made should be kept in stock for use when needed, almost any tone of color can be produced by a simple mixture. For instance, a WALNUT BROWN can be obtained by mixing three parts in volume of YELLOW TINCTURE, three parts of MAROON TINCTURE, and two parts of OIL BLUE-BLACK TINCTURE. A tinter or any man of average intelligence accustomed to work in a paint factory, will thus be enabled to duplicate almost any wood color desired by mixing two tinctures or three in varied proportions.

About the use of

OLEATE COLORS, TURPENTINE COLORS, SUDAM COLORS AND OIL COLORS

in the preparation of the coloring tinctures

FROM WHICH VARNISH STAINS ARE MADE.

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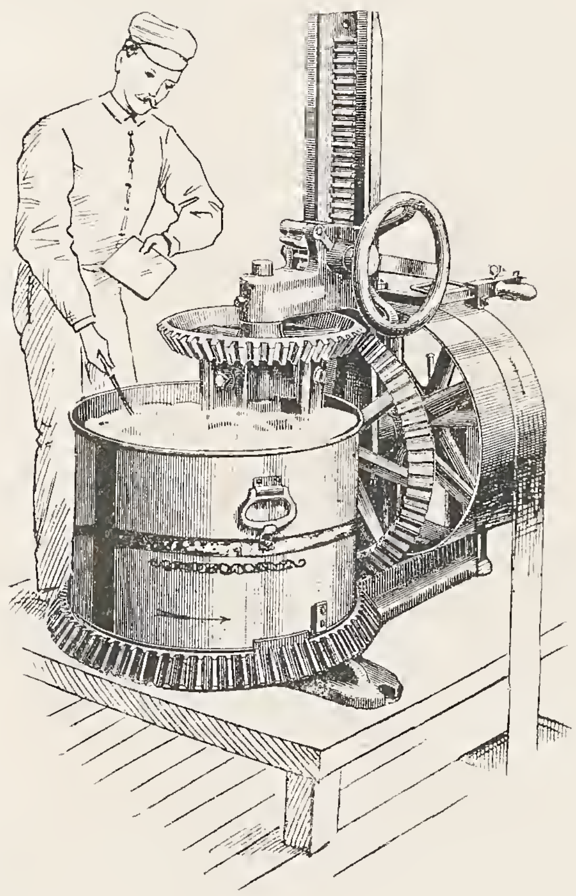
1655. The instructions given already for the preparation of the five principal tinctures from which almost any tone of wood color can be obtained, apply to the DRY COLORING SUBSTANCES manufactured especially for Varnish makers' use by Williams Bros. & Co., of Hounslow, Middlesex, England.

Other coloring substances of foreign origin are also imported to the United States for the same purpose. Amongst them can be named the soluble colors of the St. Denis Dyestuff & Chemical Co., imported by Messrs Sykes & Street, of New York; the sudam colors of the Boston Dyewood & Chemical Co.,; the oleate colors imported by Adolphus Keppelmann, of New York; the turpentine colors of Wm. Pickhardt & Kuttroff, of New York. But as it has been already said, none of these colors can be used directly in its dry state for dissolving in fat Varnishes. The concentrated tincture must be made first.

The stock of concentrated tinctures having been made, if we wish to produce a Varnish stain of a mahogany color for instance put in a poney mixer, as per illustration here below, 5 gals. of a fat Varnish, either Coach Varnish, Furniture varnish; in fact, almost any Varnish made from Kauri or Manila Gum with Linseed Oil, Turpentine or Naphtha. Put the mixer in motion and add gradually to the Varnish, a little at a time, 1 gal. of concentrated Orange



Tincture, made as per instructions already given and from the use of OIL ORANGE from Williams Bros. & Co., of Hounslow, Middlesex, England. Let the mixer run for about 15 minutes. Then try as to staining power on a piece of soft wood. Should the color of the stain be too light in tone, add more coloring; if too deep, add or dilute with more of the varnish. To cheapen, mix with ROSIN GLOSS PAINT OIL in proportion according to price. For obtaining WALNUT or CHERRY, proceed identically with other tinctures.

PART No. XVII

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF FLOWING.

Part No. XVII.

QUESTIONS OF FLOWING.

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QUESTIONS OF FLOWING.

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#1700. In ascertaining the value of a Varnish, there is not perhaps another WORKING PROPERTY which is so much taken into consideration by the Varnisher as the FLOWING.

A faultless Varnish must FLOW EASILY; it must WORK FREELY under the brush. This is an absolute requirement not only from the standpoint of accomplishing a work with greater facility, but also for the reason that a Varnish which does not FLOW EASILY under the brush cannot be applied evenly, no matter how expensive may have been the materials and gums entering its composition.

In fine work, the Varnisher considers the FLOWING as the first condition of producing the HIGHEST FINISH; and as he has often to produce a finish presenting the aspect of a glass-like surface, he rejects as unfit for use any Varnish which does not possess to the highest degree the property of FLOWING.

CORRELATION EXISTING BETWEEN THE RIPENESS OR MATURATION OF A VARNISH AND ITS FLOWING PROPERTY.

#1710. A freshly made Varnish, no matter how heavy in body is the prepared oil that has been used as a vehicle of the HARD GUMS, can never possess the FLOWING of a perfectly RIPE and MATURE Var-

NISH. On the other hand, cheap Varnishes can be produced nowadays from COMMON ROSIN with a FLOWING that is perhaps (with cheapness) their only quality. Age undoubtedly increases the FLOWING of all Varnishes, as well as it improves all their other qualities; but it is not always possible to keep a Varnish in the store-room until age has imparted to it the proper FLOWING; and for this reason, special methods, formulas and processes capable of producing more rapidly a result so desirable as a PERFECT FLOWING, are often resorted to.

ABOUT NATURAL AND ARTIFICIAL FLOWING:

#1720. As a general rule, a FAIR FLOWING is the natural consequence of the application of first-class materials to the preparation of a Varnish.

SUPERIOR FLOWING is not only due to the use of materials of the highest grade; it is due also and mostly to the full development of a certain peculiar characteristic common to all Varnishes, and which can be regulated just as the DRYING, either naturally by AGE and MATURATION, or by ARTIFICIAL METHODS.

The ELASTICITY of a Varnish should not be confounded with the FLOWING, neither is it to be confounded with the PROPER CONSISTENCY.

Such Varnish which flows easily, may, after being dry, leave a film so brittle that the least shock will break it; the

same Varnish may FLOW so easily that after being dry it will leave a film uniform in thickness that will cover the entire surface as if a GLAZING had taken place. Still, this film may lack of elasticity and not resist without BREAKING, the contractions or expansions caused on the surface by changes of temperature.

The PROPER CONSISTENCY; although it should not be confounded with the FLOWING of a Varnish, in many instances contributes largely to it; it cannot be expected from a very thin Varnish that it will flow, neither is it to be expected from a Varnish TOO HEAVY IN BODY, TOO THICK, or not having been diluted sufficiently with the PROPER THINNER.

#1730. The FLOWING PROPERTY of a Varnish consequently depends on its ATOMIC COHESION, and the ATOMIC COHESION itself is the result of three causes which conduce equally to the FLOWING. These causes are:

1st. THE TOUGHNESS OF THE GUM.

2nd. THE BODY OF THE OIL.

3rd. THE EXACT PROPORTION OF THINNERS.

The ATOMIC COHESION must be calculated so as not to be beyond a certain limit; otherwise, the Varnish would WORK HARD UNDER THE BRUSH. It cannot be under that limit either, as otherwise the Varnish would lacl adhesive power when applied on a vertical surface and consequently would "RUN".

As the 3 causes which mostly contribute to the FLOWING of

a Varnish are perfectly known; these are, the TOUGHNESS OF THE GUM, the BODY OF THE OIL, and the EXACT PROPORTION OF THINNERS; it becomes then possible to develop to its full extent the FLOWING PROPERTY in a Varnish by combining under the most favorable conditions of experiment the rapid action of these three causes, which are each one of them separately under the control of the Varnish maker or the operator.

There seems to be a NATURAL LAW about Varnish making which prevents the excessive development of one of the GOOD WORKING PROPERTIES of a Varnish under penalty of destroying at the same time all the other desirable features of this Varnish.

For instance: If it is possible by the use of energetic OXIDIZING COMPOUNDS to make a Varnish containing Linseed Oil dry superficially over night, the development of this "DRYING" can only be accomplished to the detriment of the WEAR or DURABILITY.

Regarding the FLOWING of a Varnish, the case is exactly the same; its VISCOSITY can be developed artificially by the PARTIAL SAPONIFICATION of the oil and the gum resin entering its composition; but an excessive FLOWING or VISCOSITY can only be imparted to a Varnish at the detriment of its DRYING PROPERTY.

A faultless Varnish is not, therefore, the one which will possess one particular quality to a greater extent than another Varnish; a Varnish DRYING VERY QUICKLY or FLOWING VERY EASILY may be very poor in many other respects. Conseqently, the true "ART

of VARNISH MAKING" consists in developing harmoniously in a Varnish all the elements which will contribute to insure in the largest measure:

1st. THE WEAR.

2nd. THE TRANSPARENCY.

3rd. THE HARDNESS.

4th. THE GLOSS.

5th. THE FLOWING.

6th. THE ELASTICITY.

But as it has been already said: Very often the Varnish manufacturer cannot keep a Varnish in tank long enough to become RIPE; he may be compelled to ship it before a complete maturation, which alone could insure the full development of all its working properties. In such case, the working property which is particularly needed, QUICK DRYING, for instance, or SUPERIOR FLOWING, is imparted to the Varnish much more rapidly by a mechanical or a chemical process.

HOW TO IMPART TO A VARNISH AN ARTIFICIAL FLOWING:

#1740. By ARTIFICIAL FLOWING is meant the peculiar and very desirable feature that a Varnish can acquire before its COMPLETE MATURATION, of working so easily under the brush that very little skill is needed to apply it evenly over a vertical or a horizontal surface.

No matter how perfect a Varnish may be, it requires a great deal of ability from the one who uses it to get the best result obtainable. The SKILL OF THE VARNISHER is as necessary as the SKILL OF THE VARNISH MAKER; and a really competent Varnisher is not more frequently found than a really competent Varnish maker; in fact, many of the defects attributed to a Varnish are often due to the imperfect manner in which the Varnish has been applied.

The SUPERIOR FLOWING of a Varnish will to a certain extent render GREAT SKILL unnecessary on the part of the Varnisher in applying a FIRST COAT or a FINISHING COAT; and it is even possible to impart such a nice flowing to a Varnish that an inexperienced hand can apply it with very satisfactory results. The great success of certain special brands of American Varnishes is due entirely to this cause And the importance of a good flowing may be easily realized from the fact that most of the Varnishes used in this country in very large quantities, by manufacturers of a thousand and one articles such as COMMON FURNITURE, WAGONS, AGRICULTURAL IMPLEMENTS, TOYS, etc., are generally applied by the inexperienced hands, the question of price precluding the use of first-class workmanship.

ARTIFICIAL FLOWING can be imparted to all sorts of varnishes before their COMPLETE MATURATION, and especially to AGRICULTURAL COACH, COMMON FURNITURE, MEDIUM RUBBING, WAGON, OIL SHELLAC, by the following methods:

1st. ARTIFICIAL FLOWING IMPARTED TO A FRESHLY MADE VARNISH BY A PARTIAL SAPONIFICATION OF THE RESIN GUMS AND THE OIL DURING THE PROCESS OF MELTING AND COOKING IN THE COPPER KETTLE.

1750. Immediately after the gum has been thoroughly liquified by heat, and the prepared oil added and thoroughly incorporated with the gums, both gums and oil can be partly saponified by the addition of 10 to 20% in weight of RESINATE OF LIME and GLYCERINE, previously prepared as per process and formula already given. The proportion should be from 10 to 20% in weight; by this I mean that if we have on fire in the Varnish kettle:

200 lbs. of Kauri, - - - -	weighing - - - -	200 lbs.
30 gals. Prepared Oil - -	" - - - -	240 "
		440 lbs.

10% of this total weight, or 44 lbs. of Dry Resinate of Glycerine should be added gradually, 5 lbs. at a time, and kept stirred in until completely melted and "taken up". Then the preparation should be allowed to simmer gently for about half an hour. It is then taken out and thinned down in the usual way.

2nd. ARTIFICIAL FLOWING BY THE ADDITION OF 1% OF A GUM VEHICLE SUCH AS WHITE CAMPHOR, OR 4% OF ELEMI, TO MELTED ZANZIBAR OR MANILA OR ANY OTHER HARD GUM.

1760. Such gums as Sierra Leone, Zanzibar and Manila present

a very desirable feature; they are VERY HARD and superior to Kauri for making Varnishes of the highest grades; but their behavior in Linseed Oil is not the same as that of Kauri; they are not so readily assimilated; and only a complete MATURATION due to age can give them the FLOWING of a first-class Varnish.

By the addition of ONE POUND OF WHITE CAMPHOR GUM per 100 lbs. of the above named copals, or 4 lbs. of elemi for the same proportion, an ARTIFICIAL FLOWING can be imparted to the Varnish before it is ripe. The extreme division of white Camphor distributed in the whole mass will at once produce a most beneficial effect.

Owing to its VISCOUS and OILY nature, every particle of camphor will contribute to SOFTEN and render more UNCTUOUS the hard gum, thus imparting to it the flowing property of an aged Varnish; and as only 1 lb. of camphor is used per 100 lbs. of hard gum, the proportion is too small to have any influence on the brilliancy and hardness of the finished product.

Elemi works like camphor; but as it is harder, the proportion should be increased to 4%.

3rd. ARTIFICIAL FLOWING BY THE ADDITION TO THE MELTED GUM OF 15 to 25% OF FRENCH ARTIFICIAL KAURI.

#1770. A somewhat similar result to that obtained from a mixture of RESINATE OF LIME and GLYCERINE with COPAL GUMS, can be obtained

also by the addition of 15 to 25 lbs. of FRENCH ARTIFICIAL KAURI to every 100 lbs. of FOSSIL RESIN melted in the Varnish kettle; and as French Artificial Kauri (see its preparation) mixes in any proportion with ZANZIBAR as well as SIERRA LEONE, NORTH COAST and any kind of COPAL, it may be considered as the best material in existence for imparting a good FLOWING and at the same time reducing the cost of a Varnish made from expensive gums.

4th. ARTIFICIAL FLOWING IMPARTED TO A FRESHLY MADE VARNISH BY THE USE OF CAMPHORATED BENZINE OR TURPENTINE INSTEAD OF ORDINARY BENZINE OR TURPENTINE, IN THINNING DOWN.

#1780. Benzine and Turpentine as thinners are entirely devoid of Body or Flowing, and therefore may be considered as objectionable diluents on that account; but as it is not possible to replace them by any other diluent or solvent, the best thing to be done is to impart some VISCOSITY or OILY characteristic to them, which is very easily accomplished by the use of white camphor gum. (See formula and process for making Camphorated Turpentine and Benzine.)

Camphorated Benzine used as a thinner instead of ordinary Benzine, will impart to the Varnish a far better flowing.

5th. ARTIFICIAL FLOWING IMPARTED TO A FRESHLY MADE VAR-

NISH BY MIXING COLD WITH IT, ABOUT A WEEK AFTER IT HAS BEEN MADE, THE AMOUNT OF IO TO 20% OF A "TOUGH" PREPARED LINSEED OIL, OXIDIZED WITHOUT THE HELP OF HEAT BY THE DIRECT ACTION OF A CURRENT OF AIR THROUGH IT, INSTEAD OF THE USE OF BORATE OF MANGA-NESE OR METALLIC OXIDE.

#1790. In the special chapter on the intense oxidizing and bodying of Linseed Oil for use in Varnish making, has been described at length the preparation of a very clear and almost colorless Varnish Oil having a great "Body" but too much "Toughness" for it being possible to cook it with the melted gum in the Varnish kettle. This oil is "QUICK DRYING", and can be mixed readily "COLD" in any proportion with a Varnish.

If we add 5 gals. of this oil to a cheap FURNITURE or COACH VARNISH one week old, the oil will impart to the Varnish at once a very desirable FLOWING.

In Varnishes such as MEDIUM, WEARING BODY, the proportion could be raised to 20%; but in this case, in making the Varnish first and before thinning down, the amount of oil cooked with the gum should be reduced accordingly, so as not to get too much oil in proportion to the gum used.

Experience demonstrates that "TOUGH" Oil, added cold in this way to a Varnish, will give to it 50 per cent more flowing

than could be expected from the same amount of a prepared oil, oxidized by Borate of Manganese or Metallic Oxides, and cooked with the gums right in the Varnish kettle by the ordinary method and process.

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PART No. XVIII

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS OF WEAR AND DURABILITY

IN A VARNISH.

Part No. XVIII.

QUESTIONS OF WEAR AND DURABILITY IN A VARNISH.

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QUESTIONS OF WEAR AND DURABILITY IN A VARNISH.

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#1800. The important question of durability, which in Varnish making is called WEAR, is not always the first consideration in the finished product.

It is evident that Varnishing is intended for beautifying a surface, and consequently this implies an expenditure calculated in proportion to the value of the article, the appearance of which is to be improved by the application of the Varnish.

The durability of a Varnish depends first on the quality of the gum; second, upon the proportion of oil.

The oil in a Varnish contributes greatly to its elasticity and increases considerably its adhesive power upon the surface where it is applied; the gum insures the gloss, the hardness and the brilliancy of the finished product.

Four-fifths of the Varnish manufactured in the United States is sold for manufacturing purposes, and only 1/5th goes directly into the hands of the Varnisher, the cabinet maker or the finisher.

The most expensive ingredient in the manufacture of Varnishes, figuring the yield in gals., is, first the gum, second, the oil and third, the diluent or thinner. This, however, is only

true with FAT VARNISHES; and as in many instances the price of a strictly first-class Varnish would be a bar to its use, cheaper ingredients are resorted to.

The durability of a Varnish is therefore regulated by the quality of the ingredients, and in the majority of cases, by the applications for which the Varnish is intended.

Durability is unnecessary: for instance in a Varnish which has to be applied on manufactured products, such as toys, agricultural implements and other applications where rough handling will soon remove the coating. It is only the exceedingly low price for which certain Varnishes of inferior grades can be made today which induces large manufacturers to adopt this material as the best agent to change the rough appearance of their wares for a more attractive one.

Thousands of articles manufactured are Varnished over nowadays which were not even painted only ten years ago. Progress is going on in every branch of industry and in the manufacture of Varnishes as well as in other branches.

When a Varnish is intended to have great durability, it is hardly to be inferred that this Varnish is [illegible] for application on manufactured articles, such as plows, agricultural implements or toys. Consequently, the word DURABILITY or WEAR has a meaning that the application for which the Varnish is intended alone can explain.

RESULTS OF EXPERIMENTS MADE WITH A VIEW TO ASCERTAIN THE WEARING OF A VARNISH MADE FROM KAURI GUM AND ALL SORTS OF PREPARED OILS.

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#1810. In order to ascertain the WEAR or DURABILITY of a Varnish made from the very same amount of resin gum and the very same amount of oil, experiments have been made successively with all sorts of Prepared Oils, and the results have been as follows:

WITH NO. I BORATE OIL:

Using 20 gals. of it per 100 lbs. of KAURI XXX, and thinning down with 20 gals. of Turpentine, the result has been a Varnish presenting a great deal of durability and resistance to atmospheric exposure; but not as durable as a Varnish made from the same amount of Kauri and Turpentine, using either ordinary Linseed Oil or heavy body oil treated mechanically without the use of chemicals.

The comparative table of durability or wear given on the next page, shows at a glance the relative value of all sorts of oils considered as elements of"WEAR".

#1820.

T A B L E S H O W I N G C O M P A R A T I V E L Y

THE WEAR OR DURABILITY

Imparted to a Fat Varnish made from KAURI by all sorts of oils.

-:-:-:-:-:-:-:-

FIGURING THE MAXIMUM OF WEAR OR DURABILITY BY 100, THE RESULTS HAVE BEEN AS FOLLOWS:

WITH AMERICAN COMMON RAW LINSEED OIL - - - - - - - - - - - -	85
WITH AMERICAN REFINED OR BLEACHED LINSEED OIL - - - - - - -	97
WITH CALCUTTA RAW LINSEED OIL - - - - - - - - - - - - - - - - - -	89
WITH CALCUTTA REFINED OR BLEACHED LINSEED OIL - - - - - - -	99
WITH CALCUTTA BLEACHED AND THICKENED BY A CURRENT OF AIR	100
WITH BORATE OF MANGANESE OIL NO. I - - - - - - - - - - - - -	82
WITH BORATE OIL NO. II -	81
WITH BORATE OIL NO. III -	80
WITH OIL NO. IV, MADE FROM BORATE AND A CURRENT OF AIR -	78
WITH OIL NO. V, PREPARED WITH MANGANESE OLEATE - - - - - -	84
WITH OIL NO. VI, made from GRANULATED MANGANESE AND SODA-	83
WITH OIL NO. VII, OXIDE OF MANGANESE AND SAL AMMONIAC - -	82
WITH OIL NO. VIII, PREPARED FROM RED LEAD AND LITHARGE -	72.
WITH OIL NO. IX, PREPARED FROM OLEATE OF LEAD - - - - - - -	78
WITH OIL NO. X, OR LEAD FURNITURE OIL - - - - - - - - - - - -	74
WITH HARD UMBER OIL NO. XI - - - - - - - - - - - - - - - - - - -	76

WITH NO. XII FINISHING OIL - - - - - - - - - - - - - - - - -	79
WITH OIL NO. XIII OR EXTRA HARD RUBBING POLISHING OIL - -	76
WITH AGED AMERICAN LINSEED OIL - - - - - - - - - - - - - - -	100

#1830. From the above table it may be seen that the slower a prepared Linseed Oil dries, the longer it lasts; and consequently the greater amount of WEAR it imparts by its association with a gum to the finished product or Varnish.

Lead Oils should be avoided in Varnishes where durability or wear is the first requirement.

The harder an oil dries, the greater is its tendency to become pulverent, which means a loss in its adhesive power or durability.

It may be seen also from the above table, that Linseed Oil prepared with oleate of manganese, possesses a greater wearing property than any Borate of Manganese Oil, which can be accounted for the superior elasticity of Oleate of Manganese Oil over Borate prepared oils.

American Linseed Oil which has been allowed to settle and clarify by standing undisturbed for at least one year in tank, acquires amongst other very valuable qualities, that of being exceeding durable. In the experiments above referred to, Varnishes made from aged American Linseed Oil have shown the maximum degree of durability to outside and atmospheric influences.

PART No. XIX

(See Index on the next page.)

SUBJECT TREATED.

QUESTIONS CONCERNING

THE RIPENESS OR MATURATION OF A VARNISH.

Part No. XIX.

QUESTIONS CONCERNING

THE RIPENESS OR MATURATION OF A VARNISH.

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INFLUENCE
OF
RIPENING AND MATURATION

On the working qualities and intrinsic value of a Varnish.

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#1900. Varnishes, and especially Fat Varnishes containing more or less Linseed Oil as an element, are not as a general rule considered ready for shipment immediately after the last operation of thinning down has been performed.

Even when a Fat Varnish after having been perfectly clarified through the filter press and sent to the Varnish tank, it does not possess all the peculiar advantages and WORKING PROPERTIES which it will acquire with time; it is not RIPE and requires "MATURING" before all its latent qualities can be fully developed.

Through RIPENING or MATURATION, any kind of Varnish, from the lowest to the highest grade, improves wonderfully; but this notable change is much more apparent in Varnishes of the best class, especially WEARING BODY VARNISHES, QUICK RUBBING and FLOWING

Through RIPENING or MATURATION, the DRYING PROPERTY of a Varnish is first developed to its full extent. The FLOWING PROPERTY is also developed, the color becomes lighter, the transparency attains its limit, the greatest amount of WEAR is obtained also; while all the multiple causes which directly or indirectly could contribute later on to these drawbacks often inexplicable and

known as "VARNISH DEVILTRIES" are to the greatest possible extent eliminated.

A cheap Varnish, or in other words, a Varnish made from materials of second order, containing NAPHTHA instead of TURPENTINE, and PREPARED ROSIN instead of HARD GUMS, may (if RIPE and MATURE), be found working better, easier and nicer than a much more expensive Varnish, the qualities of which have not been fully developed through RIPENING or MATURATION.

And in some instances, a Varnish can be seen having a very little intrinsic value, considering only the materials entering into its composition; and, however, working so satisfactorily that the consideration of wear is sometimes forgotten.

Amongst the numerous methods and processes further on described, will be found formulas calling for cheap materials, as Rosin, Naphtha, etc.; still, the result obtainable from the association of these materials through a rational working and under the best possible and most favorable conditions, will be far superior than it could be expected from much more expensive materials, such as KAURI, TURPENTINE, etc., associated together under different conditions.

A good working of a Varnish in the kettle is not always sufficient to produce an article fully up to the highest standard of excellence in WEAR, FLOWING, DRYING and TRANSPARENCY. A great deal of the quality depends on other causes.

CAUSES WHICH CONTRIBUTE MORE DIRECTLY TO THE RIPENING AND MATURATION OF FAT VARNISHES.

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¶1910. Amongst the causes which contribute more directly to the RIPENING and MATURATION of Fat Varnishes, some are NATURAL, others are ARTIFICIAL. The NATURAL CAUSES as a general rule are very slow in their action; the ARTIFICIAL CAUSES are more rapid, but their efficacy is apparent rather than real. A Fat Varnish requires a certain time to "SET HARD", or in other words, its adhesive power to a surface is the consequence of a chemical change named OXIDATION, which cannot be accelerated beyond a certain limit by an artificial process without affecting the WEAR or DURABILITY of the Varnish. It is certainly possible to prepare a FAT VARNISH drying hard in 36 hours and even in less time than that if necessary. In order to accomplish this result, three conditions are required.

1st. THE OIL MUST BE OXIDIZED TO ITS MAXIMUM.

2nd. THE PROPORTION OF OIL IN THE VARNISH MUST BE SMALL.

3rd. THE PROPORTION OF THINNER MUST BE LARGE.

Such Varnish will set hard, not exclusively through OXIDATION, but its drying will be greatly due to the evaporation of its volatil element or thinner, which will leave the fixed ele-

ments, viz: the gum, the resin and the oil, forming a thin coat presenting but very little, if any, durability.

OIL being the essential element of LIFE, WEAR and DURABILITY in a Varnish, the proportion of the oil comparatively to the total amount of gum and thinners must be such that its binding property will not be so much reduced as to be entirely destroyed.

Consequently, in order to get the maximum amount of WEAR in a Varnish, this must contain a proportion of Prepared Oil, large enough to insure the proper ELASTICITY, but not too large; as beyond the proportion of 30 GALS. OF OIL PER 100 LBS. OF GUM the resulting product is hardly a Varnish but more like an oil.

A Varnish drying slowly sets much harder and more firmly; it adheres more closely to the surface upon which it is applied than a QUICK DRYING VARNISH.

Consequently, QUICK DRYING and DURABILITY or WEAR are two qualities utterly incompatible together and that it would be useless to attempt to combine in the very same Varnish.

They can be combined to a certain extent; and the talent of a practical Varnish maker nowadays consists first and above all in a perfect understanding of the correlation which must exist between these four qualities: the DRYING, the GLOSS, the WEAR and the COLOR.

To what extent the DRYING PROPERTY of a Varnish can be sacrificed to the WEAR; to what extent the COLOR, GLOSS and

TRANSPARENCY can be sacrificed to the DRYING; and to what extent all these qualities must be present in a Varnish at a given price, so as to get, at the lowest possible factory cost, the maximum amount of each one of the above qualities combined in the same product; such is the true "ART OF VARNISH MAKING" from the American standpoint, which it may be said is entirely different from the English standpoint in Varnish making.

In England, the RIPENING and MATURATION of a Varnish and all the good working qualities deriving therefrom, are due entirely to the beneficial effect of age; not only the age of the Varnish, but also the age of the Linseed Oil, which is not freshly made, as it is in nine cases out of ten with American Linseed Oil used for Varnish making.

One of the chief causes of the superiority of English over American Varnishes, is to be attributed to the age of the Linseed Oil. English Linseed Oil is faultless, inasmuch as it is produced generally from old seeds and freed entirely from all MUCILAGE, FATTY ACIDS and "FOOTS"; while the American Linseed Oil, no matter whether it has been made by percolating or the HOT PRESSURE PROCESS, contains a considerable amount of mucilage which hardly can be eliminated by the usual process of filtering.

English Linseed Oil is to American Linseed Oil what CALCUTTA is to AMERICAN OIL; it is much purer, transparent, whiter and consequently oxidizes to a far greater extent.

#1910. THE MATURATION OR THE RIPENING OF A FAULTLESS VARNISH IS DUE TO ONE OR SEVERAL OF THE FOLLOWING CAUSES:

1st. THE EFFECT OF AGE.

2nd. THE EFFECT OF A MILD TEMPERATURE.

3rd. THE SOLAR ACTION.

4th. THE PARTIAL EVAPORATION OF THE VOLATIL THINNERS.

5th. A PERFECT ELIMINATION OF "FOOTS", MUCILAGE, FATTY ACIDS.

6th. CAREFUL FILTERING BEFORE STORING IN TANKS.

7th. THE EFFECT OF RIPE AND HEAVY BODY LINSEED OIL.

8th. THE EFFECT OF PROPERLY BLENDING VARNISH GUMS.

As it can be seen from the above, some of the causes which contribute to the RIPENING and MATURATION of a Varnish are natural, as for instance, the EFFECT OF AGE, the EFFECT OF SOLAR ACTION and the PARTIAL EVAPORATION OF THE VOLATIL THINNERS; while the other causes can be easily regulated as to their action mechanically.

The question is one having considerable importance from the American standpoint of Varnish making, as very often Varnishes have to be sold before a complete maturation.

Further on we will at length describe some of the most successful devices to activate the maturation of a Varnish. Through them it becomes possible to impart some, if not all the desirable features of a Varnish which has been allowed to stand undisturbed in a tank for at least six months to a year.

ABOUT THE EFFECT OF AGE ON THE MATURATION OR RIPENING OF A VARNISH.

#1920. Immediately after the operation of thinning down the "BATCH" of Varnish in the Varnish kettle, it is sent through a rotary pump in the storeroom and conveyed in the corresponding tank, where the Varnish will be allowed to stand during a certain period before being ready for shipment.

According to the purity of the gum, the oil and the vehicles entering the composition of the Varnish, there is a production of "Foots", the quantity of which varies from 3 to 15%. The separation of these "Foots", through settling, eliminates the resinous matters of the gums which were not entirely soluble in the oil or the thinners; it eliminates also all the mucilage, sediment and fatty acids which may have existed in the Linseed Oil.

The separation of these matters is seldom complete before three months, after which the Varnish may be considered as perfectly purified but not yet possessing all the qualities of a RIPE and MATURE Varnish. These qualities cannot be imparted to the Varnish before 6 months, as it takes a considerable time for producing a perfectly homogeneous compound from the great variety of components and materials of which a Varnish is made.

After three months of a Varnish standing in tank, a natural bodying is slowly produced; and what is most curious about this peculiar action is that the specific gravity of the Varnish is not increased, while the drying and flowing increase considerably.

THE EFFECT OF A MILD TEMPERATURE:

#1930. Facilitates the maturation of a Varnish. It is necessary to have constantly a temperature as uniform as possible in the store-room. This is accomplished generally by the use of water heaters or steam heaters especially made for this purpose. The best temperature to keep in a store-room is 75 deg. F.; and it may be of interest to add that a temperature above 75 deg. F., instead of RIPENING a Varnish, may retard the development of its qualities, especially when soft resins exist in more or less proportion in the Varnish. A temperature too high in the store-room has another bad effect on a Varnish; it thickens it rapidly for the simple reason that it evaporates quite an amount of the volatil thinners, such as Turpentine or Naphtha.

THE SOLAR ACTION:

As it has been at length explained on the special subject of bleaching Linseed Oil, and the solar action on Linseed Oil, similar results can be noticed on Fat Varnishes. The solar action upon a Varnish has a most beneficial effect, as it increases to a great extent the degree of its transparency. There is not the slightest doubt that this action, exactly as it is the case with Linseed Oil, is entirely chemical; it has only the defect of not being practical enough to be applicable on a larger scale.

THE PARTIAL EVAPORATION OF THE VOLATIL THINNERS:

#1940. In the Varnish tank, while the Varnish sediments are settling and the Varnish is thus purified, there is at the same time a certain evaporation either of Benzine or Turpentine which takes place; this evaporation is desirable if not carried out to a greater extent than one gallon per hundred, and should be rendered possible by not closing hermetically with a cover the Varnish tank.

Through this evaporation the Varnish gains in BODY and FLOWING. Not only this, but if the Varnish tank is hermetically closed, the maturation or ripening of a Varnish is stopped and the good working properties of it cannot be developed.

A PERFECT ELIMINATION OF "FOOTS", MUCILAGE AND FATTY ACIDS.

#1950. By this we mean a perfect elimination of the free fatty acids, mucilage and sediments that the Linseed Oil inevitably contains after the flax seed has been crushed and pressed. As it has been already said, the superiority of English Varnishes can be traced in the superiority of English Linseed Oil over American Linseed, and its freedom from any of the undesirable sediments above referred to. Owing to the notable inferiority of American Linseed Oil and the considerable amount of free fatty acids it contains, the use of a filter press becomes an absolute necessity.

RATIONAL FILTERING OF A VARNISH BEFORE STORING IN TANKS:

#1955. In the special chapter on the subject of "FILTERING AND CLARIFYING VARNISHES", full particulars are given as to the best method and process suggested by experience in the application of the FILTER PRESS to the elimination of the sediments of all sort contained in an oil and a varnish.

Through the use of the filter press, as much as 98 % of these sediments can be eliminated in a very short time, and the Varnish which has been thus filtered (if sent to the tank in the store-room) will become RIPE and MATURE in about one-tenth of the time that it would require for the very same Varnish had it not been filtered.

As a general rule, Pure American Linseed Oil used by Varnish makers has not the required age for being free from fatty acids and mucilage, and for this reason more than anything else the use of a filter press has become nowadays an absolute necessity in Varnish making.

There are furthermore special kinds of Varnishes and Japans which cannot be made perfect without mechanical filtering. For instance, Gold Size Japan. In order to get the beautiful gold color and transparency peculiar to the best English make, a Gold Size Japan must be filtered through paper and by the Wood Pulp process. The same can be said about WEARING BODY VARNISHES.

Aside from the very important question of clarifying a Varnish, which cannot be accom lished better and qicker than by the use of a good filter press, there are other great advantages deriving from the separation of all the "Fatty Acids", insoluble matters, impurities and sediments which constitute what is termed "FOOTS"; these advantages are in the first place a predisposition of the Varnish to develop all the LATENT qualities and good working properties immediately after having been sent to the tank; and as there is but very little if any extraneous matters left then in the Varnish which could prevent its MATURATION, this begins to take place on the very same day in the Varnish tank instead of requiring 3 to 4 months, as it is always the case when all the "FOOTS" are separated from a Varnish gradually and very slowly by a long standing and settling in the Varnish tank.

THE PRESENCE OF FOOTS in a Varnish retards to a great extent its maturation and ripening. In fact, this maturation and ripening cannot take place before all the insoluble parts in suspension in the Varnish have been eliminated through a long period of standing in the tank, or instantly, through the combined action of this apparatus and the wood pulp process. (See improved methods of clarifying Varnishes.)

Furthermore, there are sometimes in a Varnish very diminute particles of cloudy substances which come from the gum or fossil resins, and always remain in suspension in the Varnish like

small air bubbles or specks without settling. These are hardly noticeable, but become apparent under the brush; and very often the lack of a good flowing has no other cause but this. It is enough that a Varnish contain only the small proportion of 1 per 1000 in volume of FREE, FATTY ACIDS for being unfit for HARD RUBBING; as no matter how energetic may be the dryers used, the drying will be only superficial and the part underneath the film will remain soft and unoxidized instead of solidifying thoroughly.

The association of Varnish gums of different nature is never perfect until the Varnish has fully matured; and the BLENDING together of these gums is utterly impossible in presence of mucilage or sediment. This is often the cause which makes a high grade Varnish turn "CLOUDY". Sometimes the drawback is much more serious yet, as it may happen that after being put up in can and standing undisturbed during 3 to 4 months on shelves, a Varnish is suddenly coagulated and "LIVERS UP".

In winter times, especially when the changes of temperature are frequent, it may also happen that at a temperature below zero, the FREE, FATTY ACIDS are suddenly coagulated and precipitate, while at the same time part of the varnish gum is separated from the oil and granulates at the bottom of the can.

From the above, it may be seen how important it is to eliminate entirely by filtration, through filter press, paper and wood pulp, all the insoluble parts of a Varnish before sending it to the Varnish tank for MATURATION and RIPENING.

And the foregoing remarks are not only applicable to such Varnishes as WEARING BODY and those which contain a large percentage of oil; they are applicable also to low grades of Varnishes containing second-class gums, and in many instances PREPARED ROSIN; as in these Varnishes there may be fully as much impurities deriving from the gum as from unripe Linseed Oil.

THE EFFECT OF RIPE AND HEAVY BODY PREPARED OIL ON THE MATURATION OF VARNISHES:

#1960. Contributes certainly to the maturation of a Varnish; but the oil must not be too heavy, as otherwise it would not be easily associated with the melted gum. On the other hand, a very heavy oil stands a much larger amount of thinners, which may be a desirable feature in the preparation of QUICK RUBBING VARNISH, but not at all desirable when WEAR or DURABILITY is to be considered first.

In the special chapter treating at length the subject of the preparation and the oxidizing of oils, will be found the best method in existence for the special treatment and the intense bodying of all sorts of Varnish oils.

Concerning the special treatment of heavy body Linseed Oil, see methods and processes for oxidizing Linseed Oil without using chemicals such as Borate, Acetate, Oxalate or Sulphate of Lead or Manganese.

THE EFFECT OF PROPERLY BLENDED VARNISH GUMS:

#1970. As it can be seen from the above expose', many causes contribute to the maturation of a Varnish.

A Varnish to be made faultless must be made especially with a perfect knowledge and understanding of its special application.

According to the purpose for which a Varnish is intended, one of the special features of this Varnish is to be developed to a greater extent than any other. The WEAR, the FLOWING, the DRYING are thus regulated, and the proportion of oil, gums, dryers and thinners varies accordingly.

Endless varieties of Varnishes answering special requirements are thus made, and new specialties are suggested almost every day to the Varnish maker by new applications.

There is not, perhaps, a wider field for study in Practical Varnish making than the BLENDING together of several Varnish gums so as to associate the HARDNESS of one with the ELASTICITY, the TOUGHNESS and TRANSPARENCY of another, and getting thus a result far superior to anything that could be obtained from one single gum or resin having perhaps a greater value.

Certain fossil gums and resins can be mixed together to a great advantage; others cannot. In order to mix together without producing any reaction, which may cause, sooner or later, their separation in the Varnish, the various gums must be soluble

in each other's elements. Owing to the importance of this subject, it is at length treated in a special chapter. What we are now considering is the effect of PROPERLY BLENDED GUMS upon the RIPENING and MATURATION of the Varnish.

When three or four different sorts of Varnish gums, entirely soluble in each other's elements, have been melted together in the Varnish kettle, then properly cooked with the right kind of prepared oil, and finally thinned down with either Turpentine or Benzine, the Varnish resulting from such mixture, after having been filtered and sent to the tank, will require less time to become RIPE and develop all its good WORKING PROPERTIES than if it had been made from a single gum.

It must be added, however, that this is true only when the BLENDING has been done right in the Varnish kettle, and when the gums or resins used in a proportion calculated according to their peculiar working property and behavior in oil and thinners: such a gum which for instance would have a tendency to dry TACKY, may be hardened by the addition of a small quantity of ZANZIBAR. Such resin too brittle for being used alone, can be rendered ELASTIC by the addition of a little ELEMI, WHITE CAMPHOR or GUM CAMPHOR MANILA, with its tricky characteristics, may be rendered soluble in MELTED KAURI through the medium of a third element, which is RESINATE OF GLYCERINE; or through a partial SAPONIFICATION of the Manila and Kauri in melting them together.

TANK ROOM OR STOCK ROOM OF READY MADE VARNISHES.

Kept uniformly at a temperature of 75 deg. F. through the use of water heaters in winter time and ventilators in summer time.

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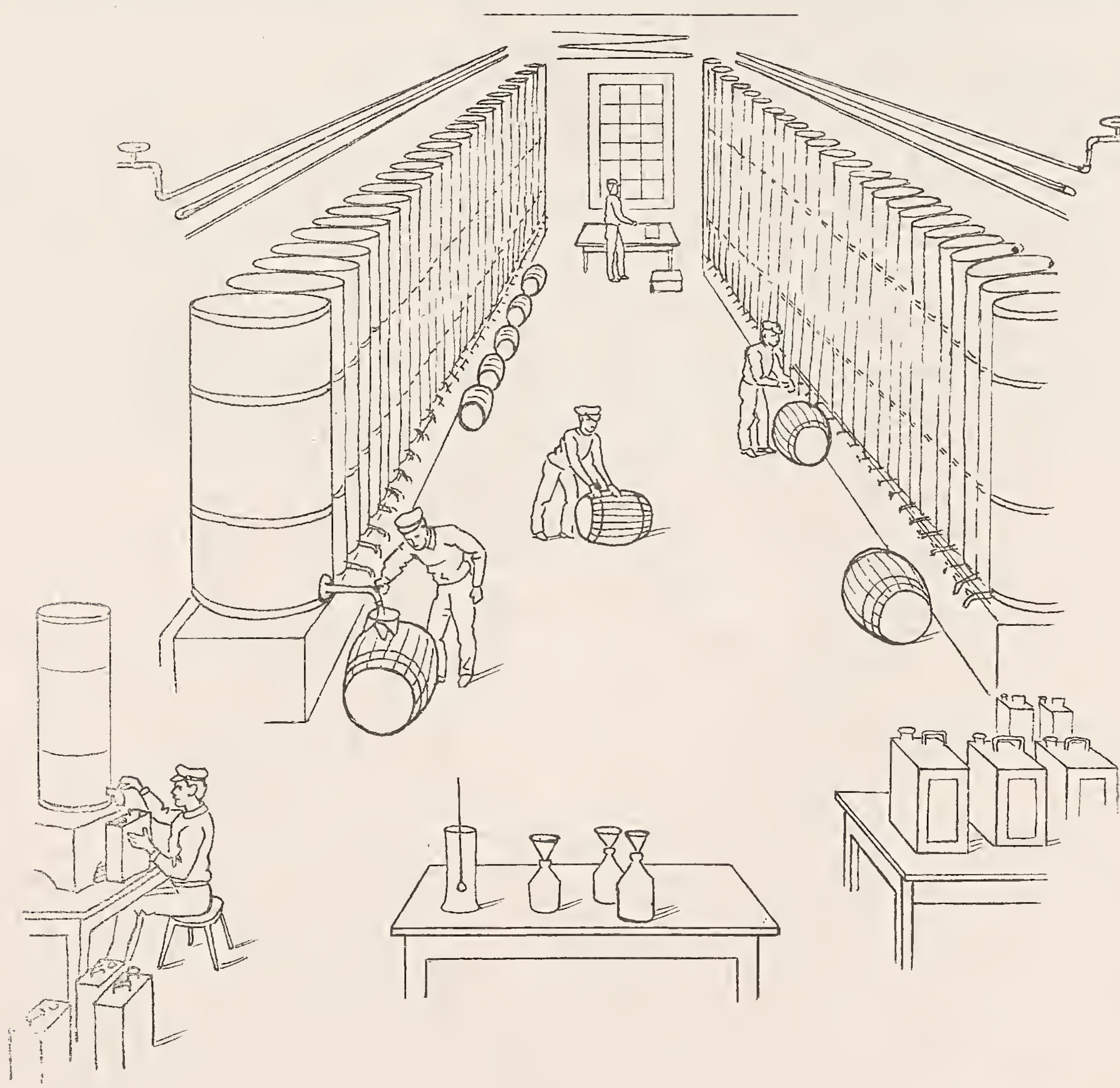
#1980. The cut underneath shows a model tank room or stock room.



Varnishes and prepared oils of all denominations are sent there immediately after being made, into the respective tanks, where they are allowed to remain undisturbed for a certain period, until the "FOOTS" have been eliminated through settling.

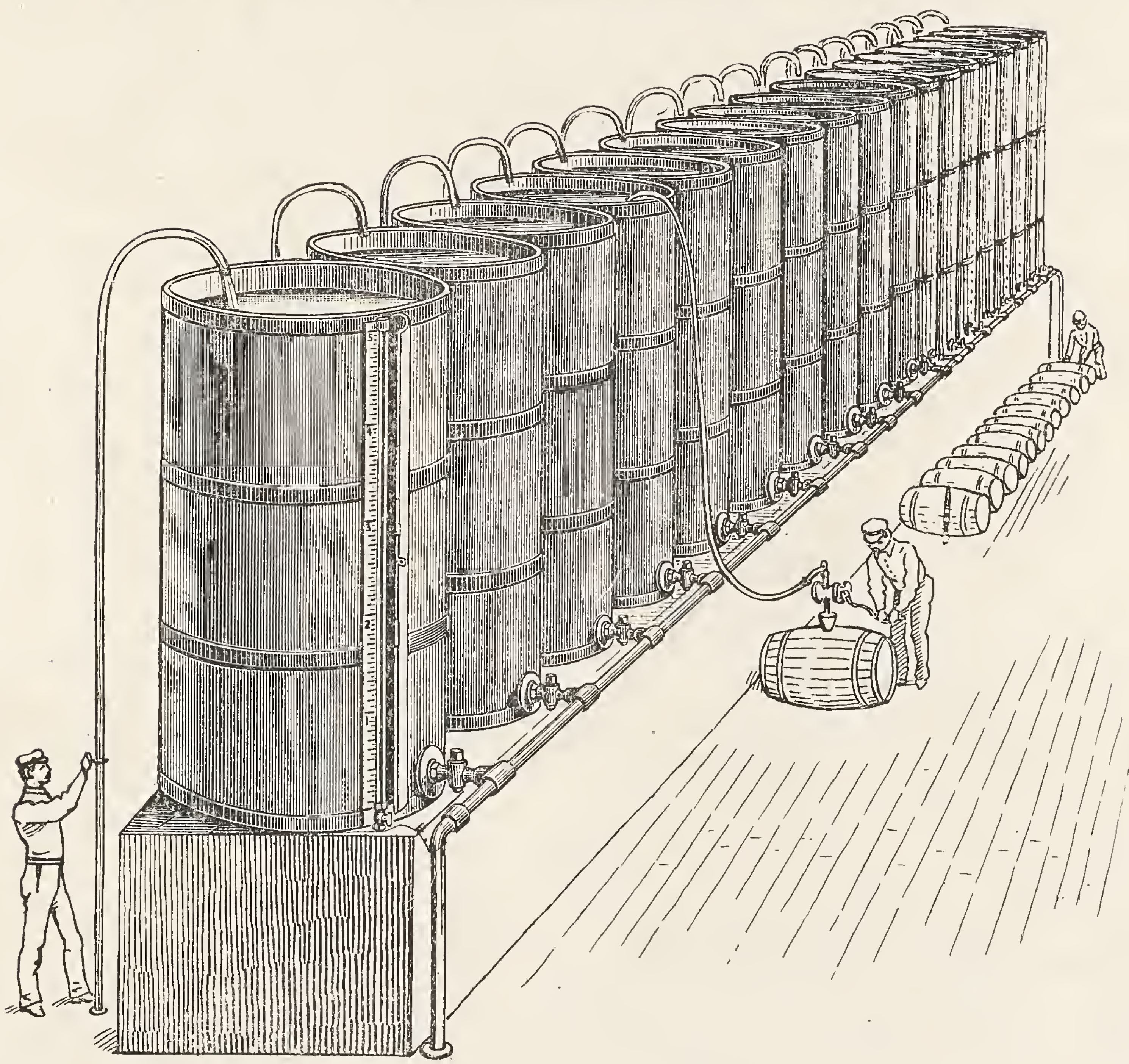
NEW METHOD OF TANKAGE OR STORAGE

by the use of

A DOUBLE BOTTOM STEAM HEATED OIL OR VARNISH TANK

according to

PROF. ERNEST MAS' INSTRUCTIONS AND PROCESSES.

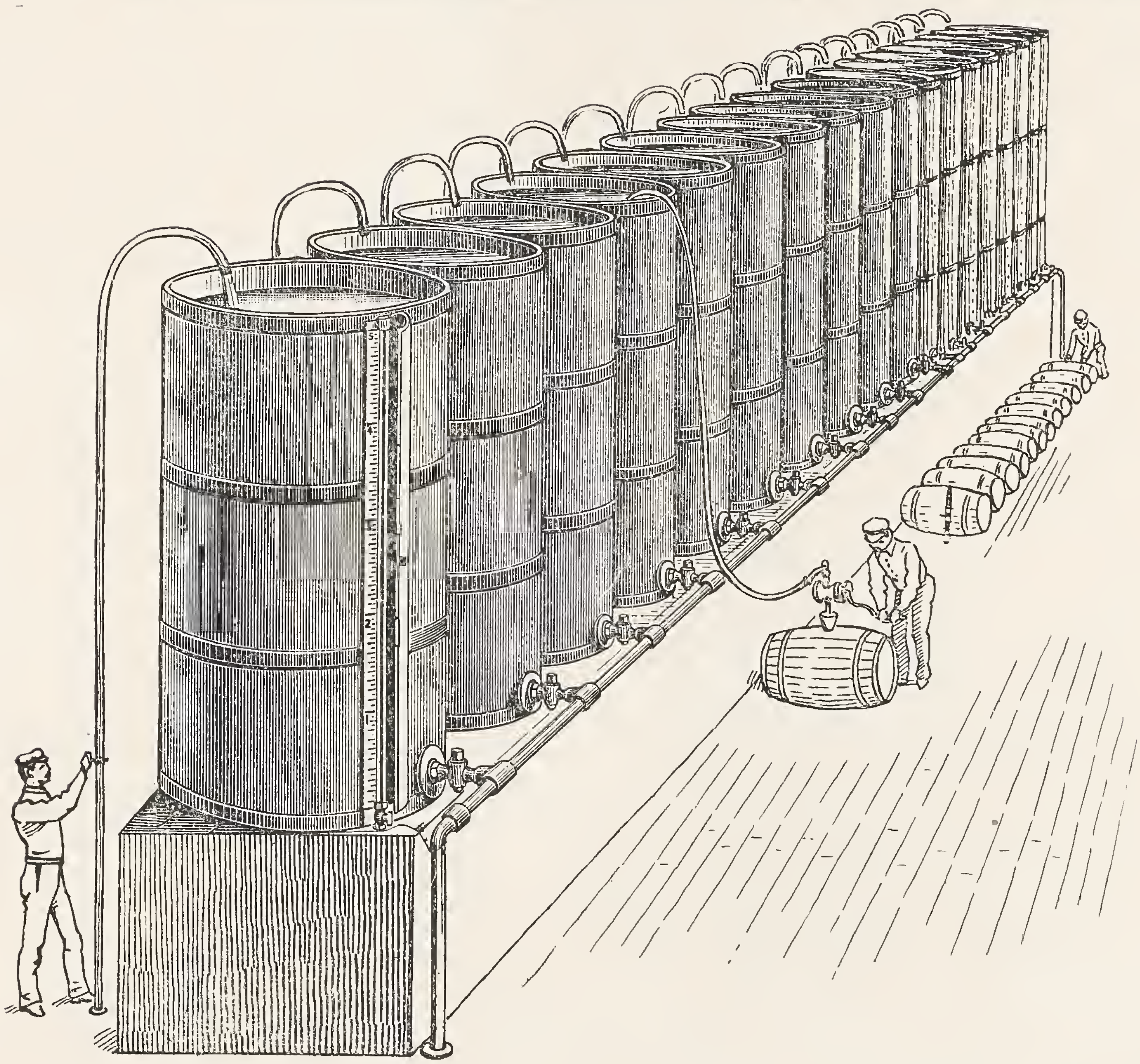


This new method of tankage or storage already adopted by the three largest Varnish manufacturing concerns in the world, is unique for developing rapidly the RIPENESS or MATURATION and the GOOD WORKING PROPERTIES of fat Varnishes, prepared oils, Varnish

oils, oxidizing compounds, Japans and dryers of every description.

It is invaluable in RIPENING AMERICAN LINSEED OIL, so as to render it rapidly similar to Calcutta Linseed Oil in oxidizing power.

For the storage of MANGANESE OILS, LEAD OILS and all

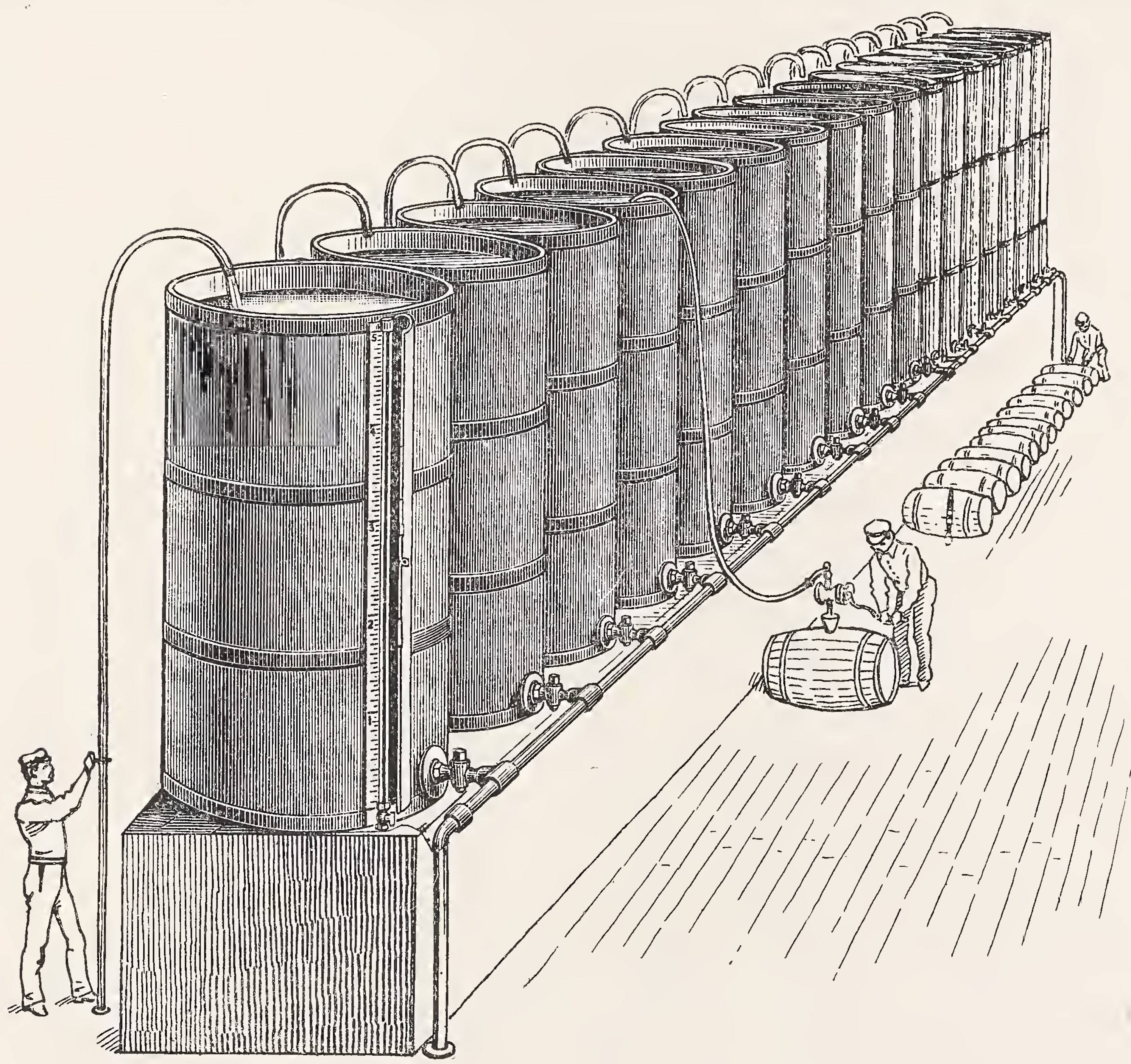


sorts of VARNISH OILS or PREPARED OILS, this new method permits of obtaining in two or three weeks the high degree of RIPENESS which would require six months by the use of the ordinary tankage made of galvanized iron in a single recipient instead of the above.

The principle upon which the RIPENING process is based

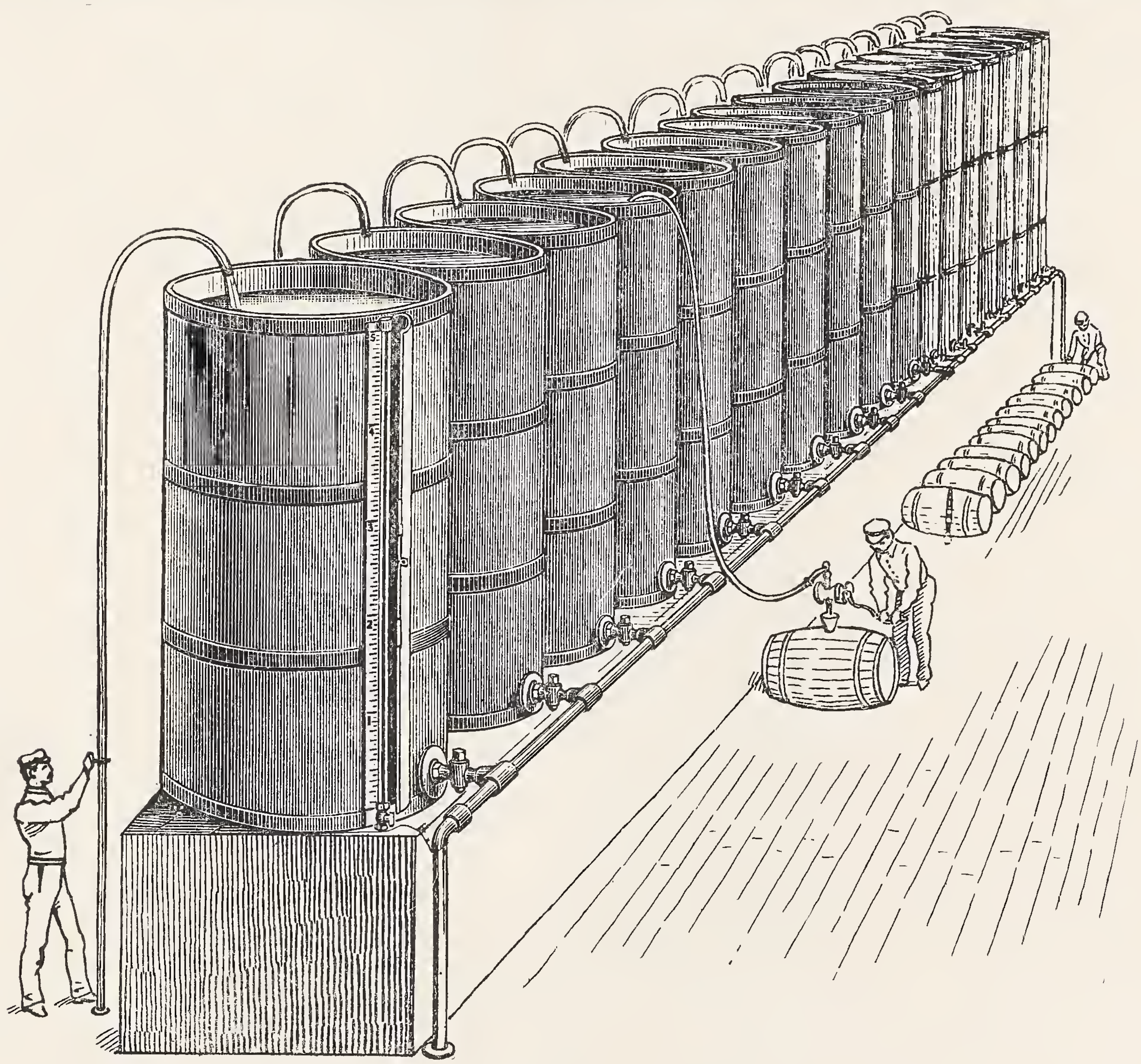
is the following:

Any kind of Linseed Oil, either raw, boiled or oxidized, becomes exceedingly fluid under the action of heat. In other words the oil, no matter how HEAVY IN BODY it is when cold, is rendered very thin by heat and the fluidity increases with the temperature



Technically it may be said that the specific gravity of either Linseed oil raw or boiled depends chiefly upon the temperature consequently, if we send a Varnish oil to an ordinary Varnish tank immediately after it has been prepared in the iron or the copper kettle, this oil, which has been rendered cloudy by the chem-

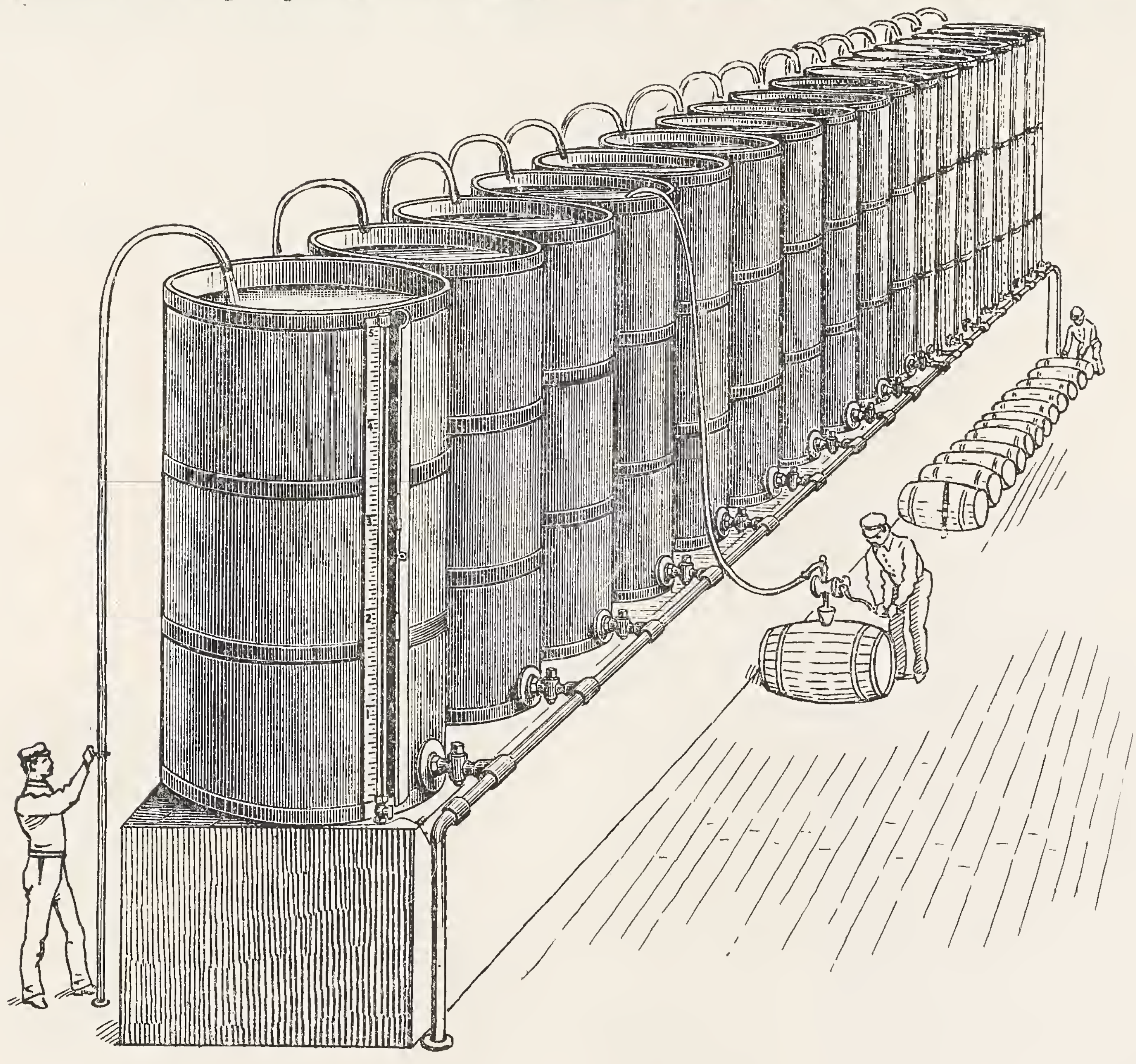
ical treatment of BORATE OF MANGANESE, OLEATE, OXALATE, GRANULATED, RECOVERED or BINOXIDE OF MANGANESE, by RED LEAD or LITHARGE, or any other material or oxidizing agent or hardening compound, such as HYDRO CALCINE or PREPARED LIME, will be exceedingly dark, or better said, cloudy, owing to the large proportion of unabsorbed materials



which for a long time will remain in suspension.

This being said, it may be easily understood that the CLOUDY PREPARATION, either oil or Varnish, above referred to, after having been sent into its respective tank for COLD STORAGE will be-

come HEAVY IN BODY in less than 24 hours, which will be required for instance in winter for cooling down. The material being cold before being clarified, it will take considerable time for all the particles of inert substances to settle, owing to the thickness of the Varnish or preparation when cold; while if we insure in the



storage tank a sufficient heat for rendering the oil or Varnish preparation perfectly fluid, and thus prevent it from thickening through cooling down, it is evident that all the particles of inert substances which render the preparation cloudy will settle in a short time, as well as all the undesirable matters.

PART No. XX

(See Index on the next page.)

SUBJECT TREATED.

THE VARNISH MAKER'S

LABORATORY AND EXPERIMENTING DEPARTMENT.

Part No. XX.

THE VARNISH MAKER'S

LABORATORY AND EXPERIMENTING DEPARTMENT.

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HOW TO ASCERTAIN THE
"BODY"
of two samples of Linseed Oil comparatively.

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#2010. It is a fact well known that Linseed Oil improves with age; it is also well known that the prolonged action of heat in Linseed Oil increases considerably its drying property and "Body".

For the production of Quick Drying Varnishes, a Linseed Oil which has been allowed to stand and settle for a couple of months after being made, is far superior to a new Linseed Oil from which the mucilage has not been entirely eliminated.

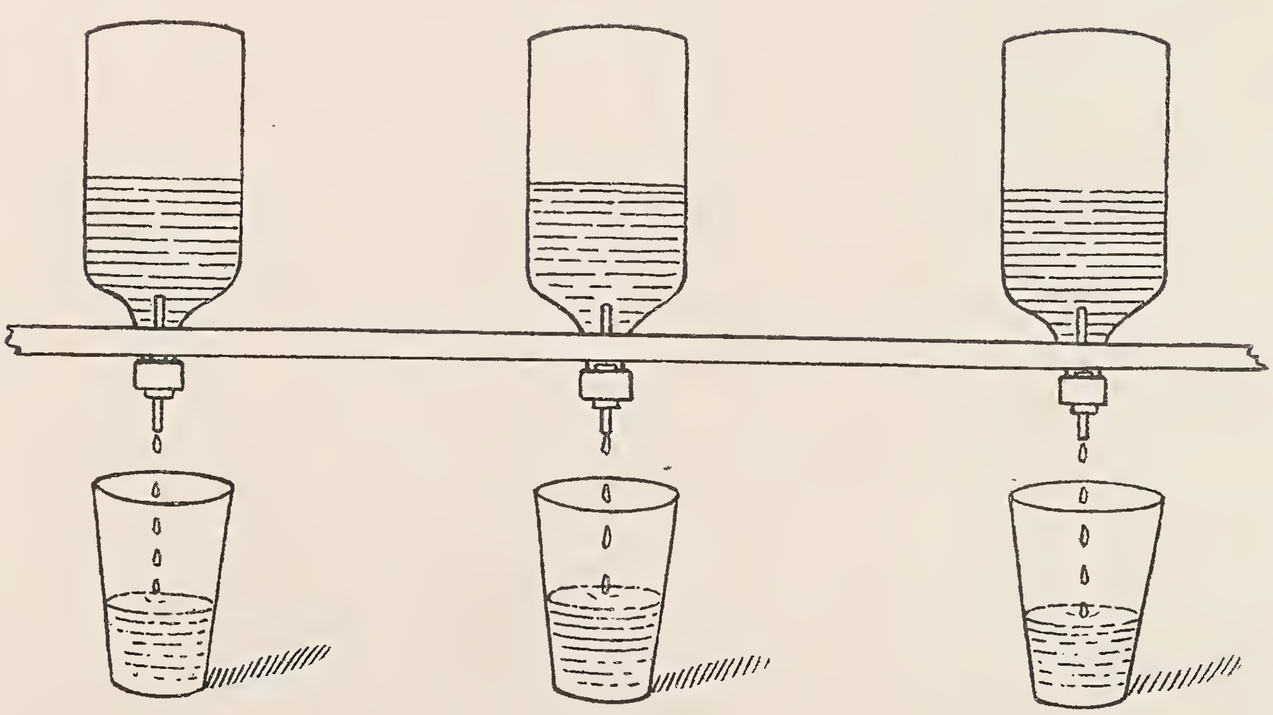
Old or aged Linseed Oil, it is commonly said, possesses "HIGHER BODY" than FRESH LINSEED OIL.

For ascertaining comparatively the "Body" of two or more samples of pure Linseed Oil, have three white glass bottles of one quart capacity, as per cut here below.

Ist. Measure exactly one pint of each sample of Linseed Oil to be tested as to body, and place it in each bottle.

2nd. Then cork it well, and insert through the cork a small glass tube.

Then reverse each bottle upside down and place a glass underneath.



The more body, the longer it will require before each bottle of Linseed Oil will empty into its respective glass.

USE OF THE VISCOSIMETER FOR ASCERTAINING THE BODY OF OILS.

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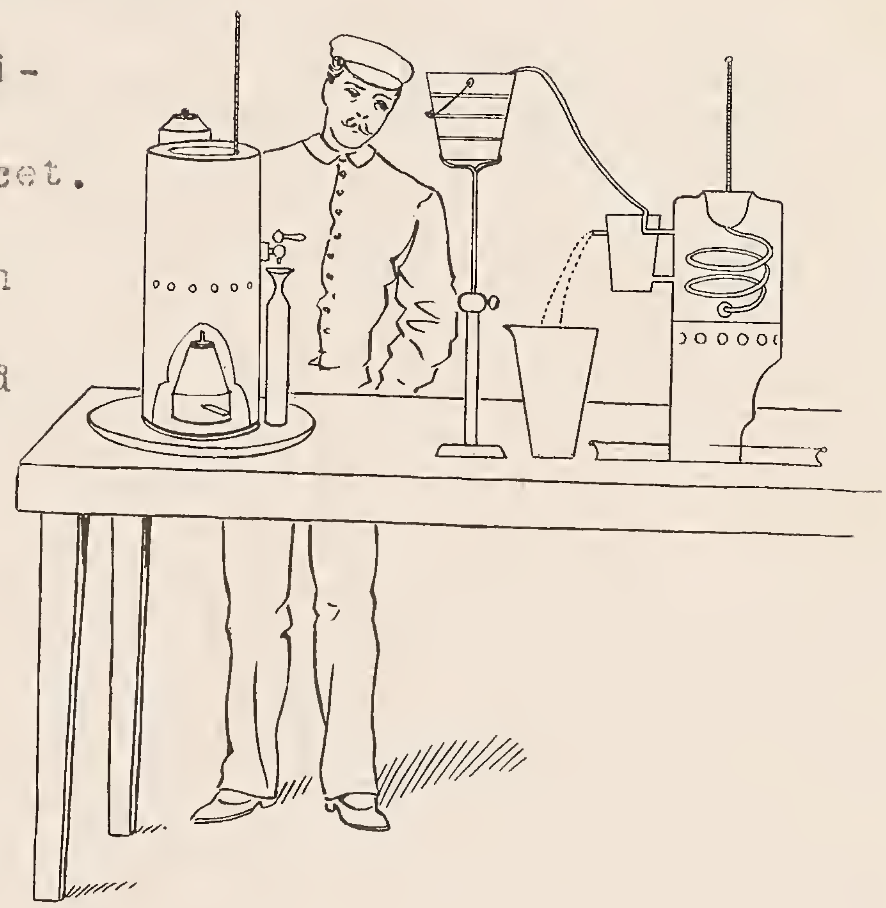
#2020. The viscosimeter is a very useful instrument in the laboratory of the Varnish maker. It shows the viscosity or body of any oil by noticing the number of seconds required for 50 cubic centimeters to run through the open faucet.



The pail A is filled with water at 70 deg. F. It is siphoned through the bath by means of a rubber tube connecting with the upper tube in the water receiver, as shown per cut. The basin C must always be kept filled to the top while the instrument is working with the oil to be tested; and when the running water has brought the temperature to 70 deg. F., as indicated by the thermometer, the faucet is opened simultaneously with starting the watch and the test made.

The test as to viscosity is the most important indication of the comparative value of lubricating oils.

HOW TO TEST PRACTICALLY GRAIN OR WOOD ALCOHOL

intended to be used

IN MAKING SHELLAC VARNISHES AND ALCOHOL LACQUERS.

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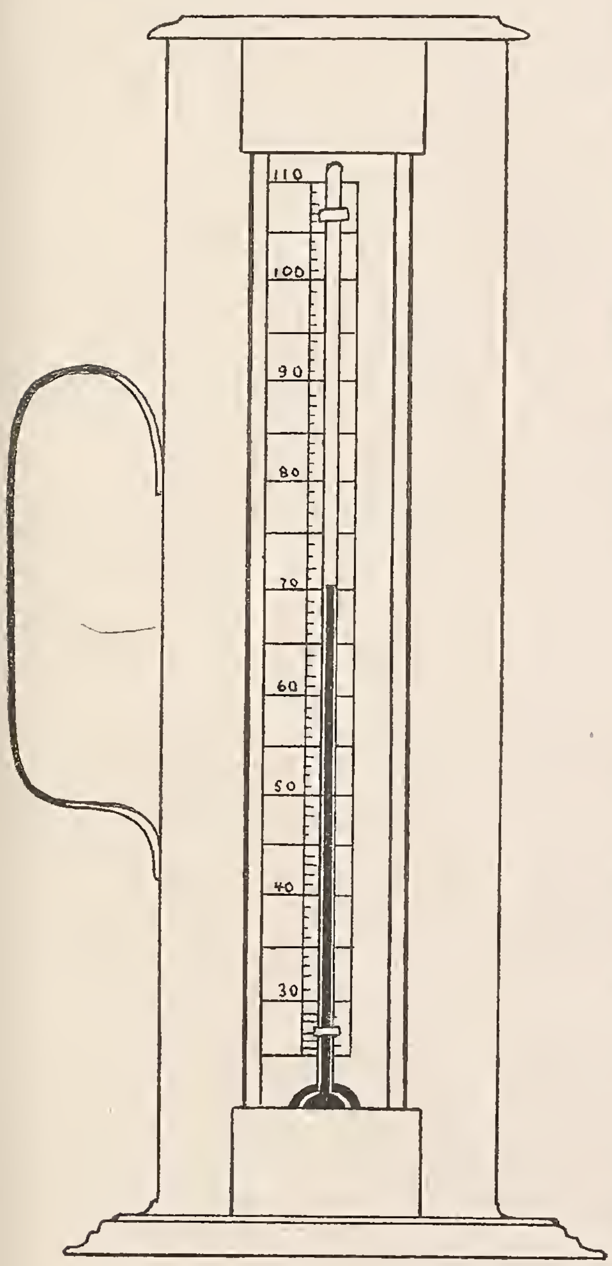
#30 0. This instrument consists of five Hydrometer stems, the scales ranging:



No. I - - - - - - - - 0 to 100

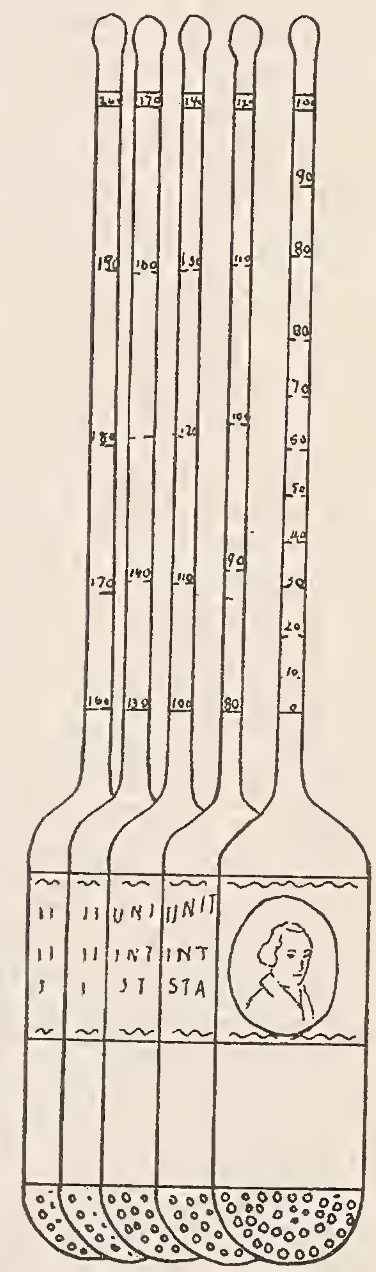
" 2 - - - - - - - - 80 to 120

" 3 - - - - - - - - 100 to 140

" 4 - - - - - - - - 160 to 200

showing the per cent of proof alcohol.

An Ivory scale thermometer inserted into a copper testing cup, enables to see the temperature of the alcohol at the moment it is to be tested. A manual of tables of corrections for temperature, etc., accompanies each set of Hydrometers. These instruments are all tested at Washington before being placed on sale. Thus their accuracy is guaranteed by the signature of the Commissioner of Internal Revenue.



INSTRUCTIONS FOR TESTING THE STRENGTH OF WOOD OR GRAIN ALCOHOL, AND BY THE USE OF THE U.S. STANDARD HYDROMETER.

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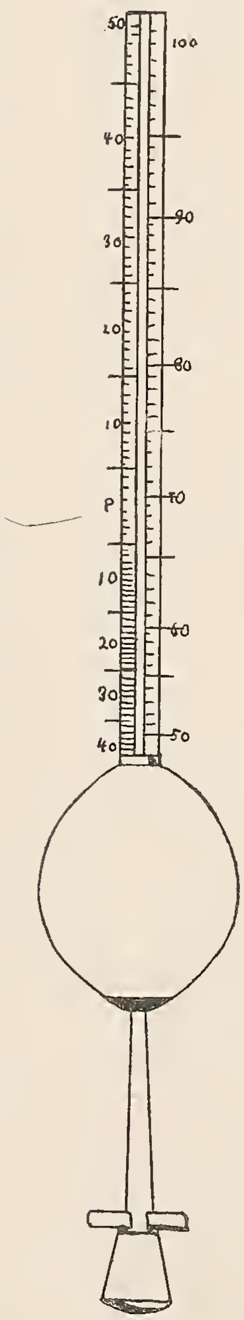
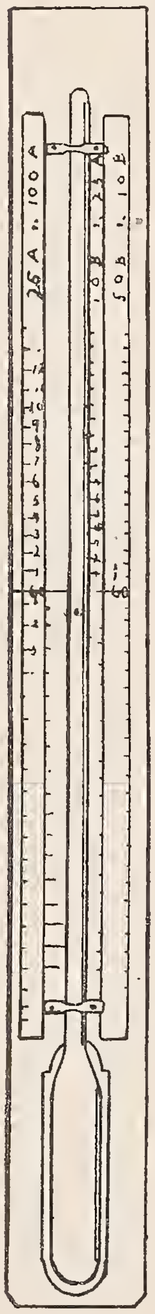
#2040. The cuts shown on the following page represent the metal Hydrometer and thermometer for inseryion in the cup for testing the strength of spirits. The thermometer has three scales for



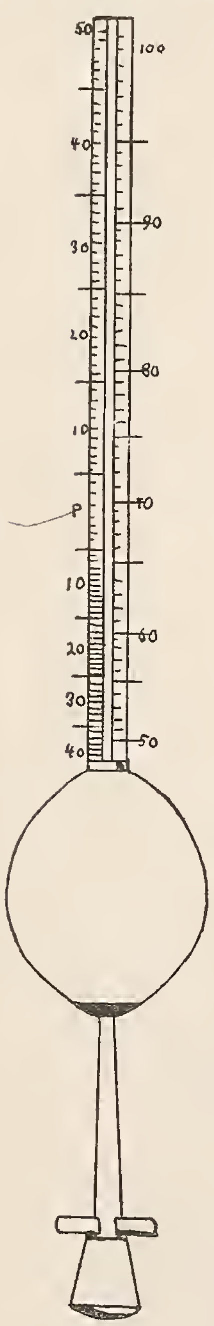
showing the corrections to be applied to the hydrometer readings for variations caused by temperature. The temperature being 60 deg. F., no corrections are required, as the Hydrometer is adjusted to this temperature. The thermometer is graduated in conformity with the Hydrometer, and has three columns of graduations representing different ranges of strength of liquors marked at the top of column:



25 A (above)	to	100 A (above.)
10 B (below)	to	25 A (above.)
50 B (below)	to	10 B (below.)

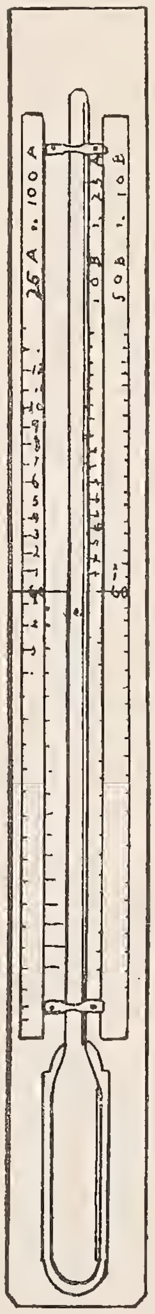
To use the instrument, fill the cup with spirits to be

tested, leaving sufficient room for the Hydrometer to be floated. Now read the indications of the Hydrometers; read the indications of the thermometer under the column corresponding with the strength of the spirit being tested. Example: The hydrometer reads 20 deg. above proof; consult the centre column of the thermometer corresponding with 25 deg. above to 10 deg. below; if this indicates 7 deg. above 60 deg., 7 deg. have to be deducted from the hydrometer indications, and the strength of the spirit will be 13 deg. above



proof. The rule for the thermometer is: when the temperature is above 60 deg., deduct the amount indicated by the thermometer; when below 60 deg., the thermometer indications are to be added. Care always should be taken to consult the proper column of the thermometer.

The laboratory of a Varnish maker should be supplied with hydrometers for liquids heavier than water, and graduated so as to afford ready reference.



Extra sensitive hydrometers are sometimes necessary, and especially for ascertaining the specific gravity of a Varnish before it is cold.

VARNISH HYDROMETERS.

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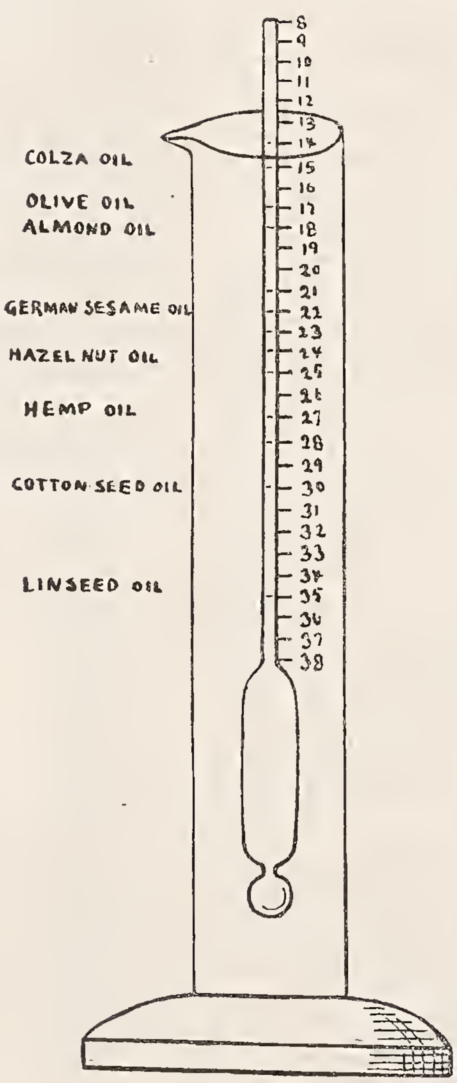
#2050. The experimenting department or laboratory of a Varnish maker should be supplied with a dozen of glass graduates about 12 inches high, in which samples of oils, turpentine, naphtha, benzole, and all sorts of diluents may be at any time tested by the use of hydrometers.



After thinning down a Varnish, if the operator wishes to ascertain whetheror not his last "BATCH" is fully up to the previous one, or to the one which he considers as being the standard, he must first test with his thermometer the temperature of the freshly made Varnish, so as to be sure that it is exactly the same as the temperature of the "BATCH" of Varnish previously tested. Then the very same instrument, named oleometer and which has been already described in the chapter on Linseed Oil, will tell him if under the same conditions of temperature the "BATCH" of Varnish which he has just thinned down has given a finished product of the same body or consistency.

VARNISH THERMOMETERS OF PRECISION

for

Ascertaining at any moment the accuracy of the various thermometers used in a Varnish factory.

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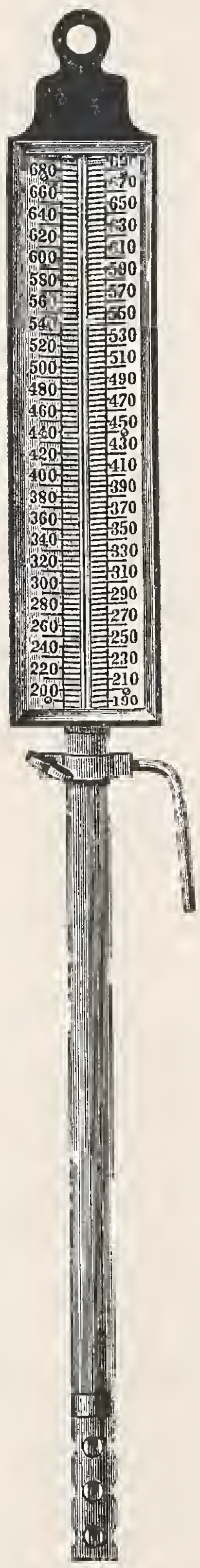


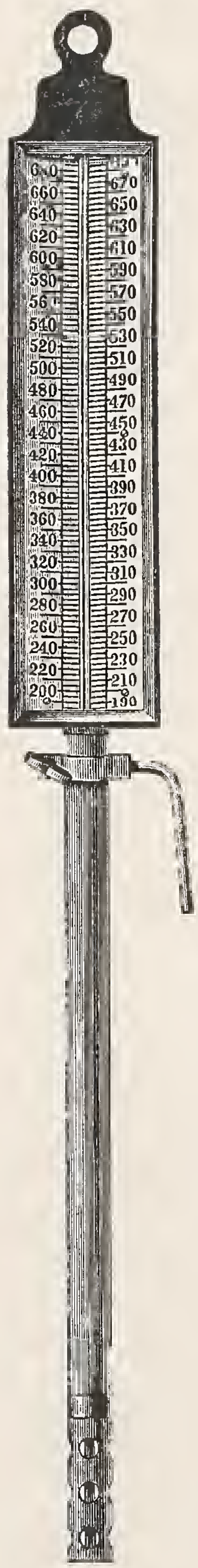
#2000. As it has been already said in the chapter No. I, relating the Questions of Temperature, the Varnish thermometers in constant use in a factory are liable to get out of order or lose their original accuracy through rough handling by inexperienced operators. Even in the hands of a Varnish maker of experience, it may happen that a Varnish thermometer of the best make shows a discrepancy of several degrees, which can hardly be accounted for.

As the finished product greatly depends upon the important question of temperature, in conducting a "BATCH" of Varnish, it is absolutely necessary to keep in the laboratory for daily reference a Varnish thermometer of precision, so as to compare with it the accuracy of the Varnish thermometers in constant use by operative Varnish makers.

There are so many causes which may contribute directly or indirectly to the lack of uniformity in two "BATCHES" of Varnish

made according to the same formula, that the greatest care should be exercised in conducting the operation under the very same conditions of experiment.

In this question of thermometers used every day and constantly for preparing oil, making Japans, etc., there seems to be a neglect which is hardly explicable. Any experienced operator knows well enough that over-heating or insufficient heating will be subsequently the cause of drawbacks or lack of uniformity in his Varnish; still, in 9 cases out of 10, the last thing which he will carefully examine is the instrument upon which he relies constantly as being infallible, or at least accurate, until it is completely worn out. In my experience, I have found that by ascertaining every day the accuracy of Varnish thermometers, the chief cause of a lack of uniformity in the very same Varnishes can be almost entirely eliminated.



With a perfect knowledge of all the imperfections of Varnish thermometers, I found it necessary to have a Varnish thermometer of precision especially constructed for my own use in ascertaining accurately temperatures. This thermometer is probably the finest in existence; and I shall be glad at any time to show it to you in comparison with your own.

PRACTICAL TEST FOR TURPENTINE.

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HOW TO ASCERTAIN ITS FREEDOM FROM BENZINE OR PETROLEUM.

#2070. Much noise has been made during the last National Convention of Paint, Oil and Varnish clubs held in Cincinnati, about turpentine being distilled together with petroleum products; but not a word of advice has been given as to the practical way of detecting the mixture.

The following test is the only one which can be relied upon. It is an exceedingly simple and therefore practical one.

Have two graduated glass tubes. In your tube No. I place a turpentine known to be absolutely pure. In the tube No. 2, put some of this turpentine, and add to it some Naphtha. Now if you place a small lump of Crystal of Iodide of Potassium in each tube, you will notice in twenty-four hours that the crystal of Iodide of Potassium will remain perfectly white and unchanged in the pure turpentine, while it will have turned yellow in tube No. 2, which contains Turpentine and Naphtha.

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PRACTICAL TEST
FOR A GOOD JAPAN DRYER.

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#2080. The selection of a good dryer not curdling Linseed Oil is a most important question in the manufacture of Ready Mixed Paints. A good dryer must answer several requirements, and therefore should be carefully tested before being used. The rapid settling and hardening of a paint in can after standing on shelves for only a couple of months, is very often due to the action of a rosin dryer improperly made. Poor liquid dryers cause more drawbacks than any other ingredient. The chief trouble derives from what is known as the "curdling" of oil, and this can be prevented to a great extent by rejecting as unfit for use any liquid dryer which cannot stand the practical test that we are going to describe.

1st. Take a piece of window glass perfectly clean and transparent.

2nd. Stick a sheet of clean white paper to the surface underneath the glass.

3rd. This being done, pour three drops of raw Linseed Oil on the surface of the window glass.

Specials

S. G. Willow No 8630.

1 gallon – 6 75
8 gallons – 3 75
1¾ gallon –

4th. Now lay in a horizontal position the piece of win- dow dow glass so as to prevent the three drops of Linseed Oil from running.

5th. Dip a small glass rod, about the size of an ordinary lead pencil, into the Japan to be tested, just enough to get one drop on it; and place that drop on the surface of the glass close by the three drops of oil.

6th. Incline the surface of the glass so as to bring the drop of dryer in contact with the oil, and watch the result closely, which is rendered much easier by having placed a white paper under the glass already.

If the dryer repels the oil, it is a conclusive proof of a lack of affinity; such a Japan dryer is not at all desirable for the simple reason that it does not mix readily with Linseed Oil, and would cause in future such drawbacks as livering up, thickening or settling at the bottom of the can, separating at the same time the pigment from the vehicle in which it is mixed.

In order to see whether this dryer curdles the oil, force the drop of dryer under examination to unite with the oil, using a needle to mix intimately the two drops upon the surface of the glass. If the mixture, instead of remaining liquid and transparent becomes gummy or opaque, this is the consequence of the oil curdling.

ORGANIZATION

OF VARNISH MAKERS

Private laboratory and experimenting Department.

#2000. If you have not at your command adequate means of investigation, experimental assay and practical tests, it is a part of the writer's business to organize private laboratories or testing rooms, and to fit them up at the lowest possible expense, with full particulars and instructions for experimental purposes.

The wonderful strides which have been of late years accomplished in all matters connected with the production of cheap Varnishes, and the keen competition which actually exists in all branches of the manufacture of these goods, renders absolutely imperative on the part of those who wish to keep pace with the onward current of improvements and successfully compete with their opponents in trade, to avail themselves of every opportunity that presents itself of adding to their knowledge and acquiring a practical acquaintance with the most MODERN IMPROVEMENTS and DISCOVERIES having a direct or indirect bearing upon the PRACTICAL MANUFACTURE OF VARNISHES.

Varnish making is no longer an affair of routine, and it requires more skill and knowledge to compete successfully in this important branch of industry, than perhaps in any other.

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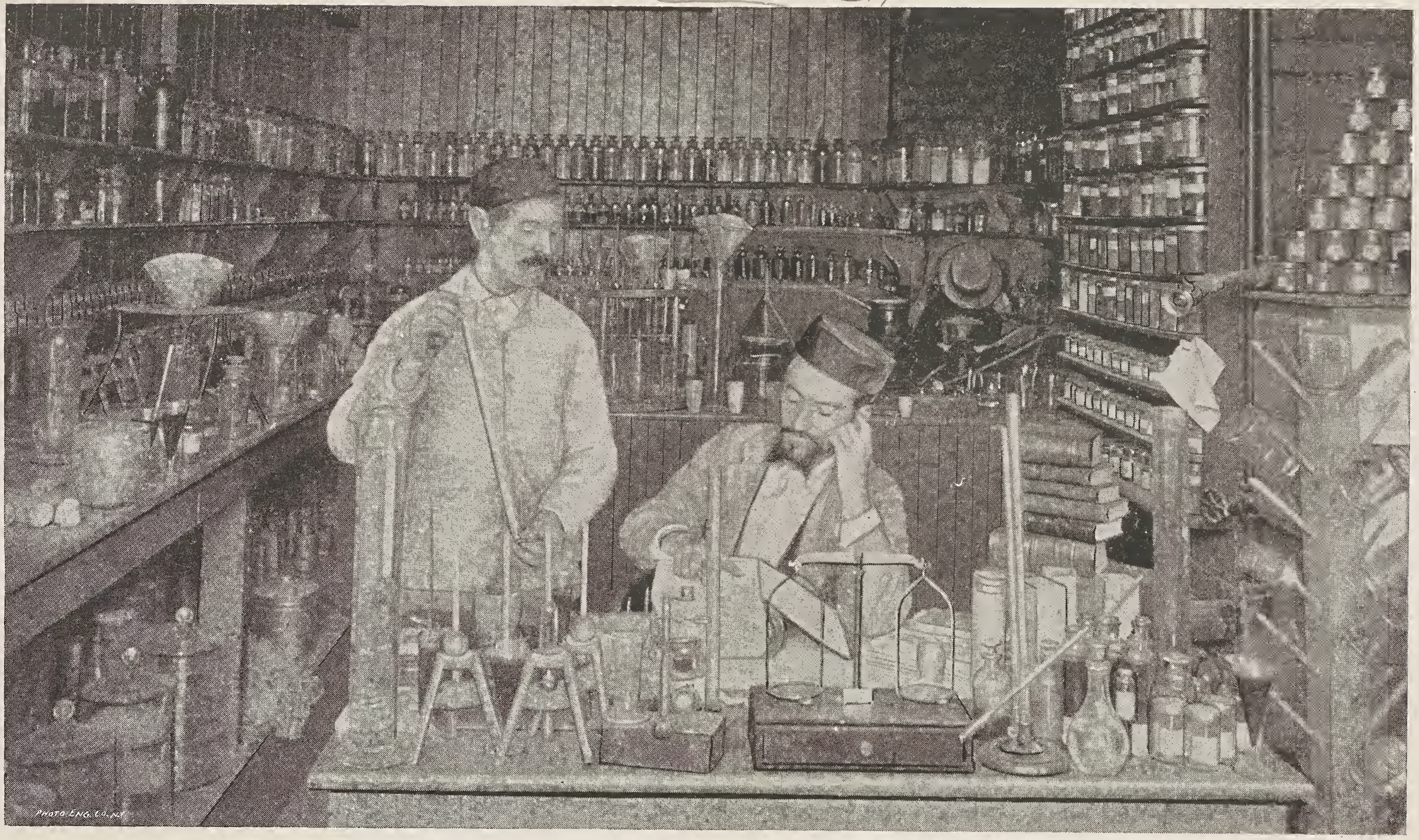

DESCRIPTIVE LIST OF LABORATORY APPLIANCES,

including Re-agents, Glassware, Instruments and Chemicals required

for fitting up the testing room of a Varnish manufacturer.

-:-:-:-:-:-:-:-

		Price.
#5180.	Apparatus to heat liquids of a high boiling point. (Intended for testing Linseed Oil as to its behavior at a high temperature):	
	One of 2 ozs. capacity - - - - - - - - - - - - -	.75
	one of 4 ozs. capacity - - - - - - - - - - - - -	1.00
#5430a.	Balances, 8 inches length of beam, including set of weights - - - - - - - - - - - - - - - -	6.00
#5494.	Gramme Weights, 1 centigramme up to 100 gram. -	1.70
#5565.	Beaker Glasses, Bohemian, one nest - - - - - -	.25
#5566.	" " " - - - - - -	.30
#5567.	" " " - - - - - -	.50
#5568.	" " " - - - - - -	.80
#5583.	One bell glass, inside diameter 9 inches - - -	1.40
#5641.	Blow-pipe of brass, 12 inches, with mouthpiece	.55
#5669.	Boiling sheet, of Russian iron, on 4 legs - - -	1.25
#5678.	Bottles, glass stoppered, of German glass, 5 doz. at $1.60 - - - - - - - - - - - - - - - - -	8.00
#5690.	Salt mouth bottles, 8 oz. capacity, at $2. - -	10.00
#5695.	Oil bottles, 8 oz. capacity, 3 doz. at $1.40 -	4.20
#7067.	Re-agents, set of 54 liquid and 18 solid, all chemically pure according to Fresenius, in 8 oz. bottles - - - - - - - - - - - - - - - - - -	35.00
		$71.60

Brought Forward - - - $71.60

#5811.	Burner, with tripod - - - - - - - - - - - - - - - -	.75
#5812.	Burner, with tripod, for gasoline - - - - - - - -	.75
#5850.	Burner, new evaporating, diameter 6 1/2 - - - -	2.00
#5851.	Burner, solid flame boiling - - - - - - - - - - - -	2.00
#5922.	Casseroles, porcelain, #3 - - - - - - - - - - - - -	.50
	" " #4 - - - - - - - - - - - - - - -	.85
#5923.	Casseroles, with cover & wooden handle, 8 oz. -	.60
#6049.	Corks, best quality, one gross No. I - - - - - -	.20
	No. 2 - - - - - -	.20
	No. 3 - - - - - -	.25
	No. 4 - - - - - -	.30
	No. 5 - - - - - -	.35
	No. 6 - - - - - -	.45
#6135.	Glass cylinder for hydrometers, 12 in. high,	
	4 at .50 - - - -	2.00
#6138.	Graduated glass cylinder 500 grammes - - - - - -	1.85
#6142.	" " " in ozs. & Fractions, 32 ozs.	3.00
#6203.	Droppers of glass, 1 doz. - - - - - - - - - - - - - -	.50
#6306.	Filters of felt, No. I - - - - - - - - - - - - - - - -	.50
#6333.	Filtering rack, 9 inches - - - - - - - - - - - - - -	.60
#6388.	Glass funnels, 3 of 30 inches at 30 cts. - - -	.90
#6390.	" Bohemian Glass, 3 of 2 1/4 in. at .15 -	.45
	3 of 4 1/4 in. at .30 -	.90
#6555.	Graduate of glass, 1 of 2 ozs. - - - - - - - - - -	.28
	1 of 4 ozs. - - - - - - - - - -	.35
	1 of 8 ozs. - - - - - - - - - -	.50
	1 of 16 ozs. - - - - - - - - -	.75
	1 of 32 ozs. - - - - - - - - -	1.25
		$94.63

B.B.

	Brought Forward - - -	$94.63
#6573.	Beaume 0,70 to 1000 - - - - - - - - - - - - - - - - - -	1.00
#6579.	Beaume 1000 to 2000 - - - - - - - - - - - - - - - - - -	1.00
#6627.	Oil Hydrometer -	.50
#6686a.	Gummed Labels, one box 201 - - - - - - - - - - - - -	.12
#6692.	One alcohol lamp, 8 oz. - - - - - - - - - - - - - - -	.90
#6833.	One glass mortar, with lip and pestle, 1 qt. -	.85
	" " " 8 oz. -	.50
#6291.	S. & S. Folded filters, 1 pack 5 inches - - -	.30
	1 " 7 1/2 " - - -	.42
	1 " 12 1/2 " - - -	1.00
#8162.	One gas stove, 6 in. diameter - - - - - - - - - -	2.50
#8202.	Supports -	1.50
#8213.	One support -	.65
#8239.	Test Tube support, complete with tubes - - - -	2.10
#8243.	" " " " - - - -	2.35
#8235.	Support for 13 test tubes, including tubes - -	.70
#8236.	" " " " - -	.80
#8270.	Test tubes, 6 x 6/8, 3 doz. at .35 - - - - - - -	1.05
#8274.	Test tubes on foot, 10 inches, 1 doz. - - - - - -	2.00
#8268.	Test glasses, 6 oz., half-dozen at .30 - - - - -	1.80
#8278.	Brushes for test tubes, 1 doz. - - - - - - - - -	.90
#8290.	One thermometer to 600 deg. F. - - - - - - - - -	1.75
#8322.	One tripod -	.35
#8389.	One Washing bottle, 1 qt. - - - - - - - -	.75
	1 pt. - - - - - - - - -	.50
	Bottles for set #7067 - - - - - - - - - - - - - - -	14.00
		$134.92

The foregoing list is not by any means intended for analytical purposes or general chemistry; but only and exclusively descriptive of the general requirements of a practical testing room of special interest to the Varnish manufacturer. The chemicals which have been mentioned are only those which must be chemically pure. There are several others not comprised in the list, and which will be needed from time to time in what is called a state of commercial purity; and that can be had in small quantity when wanted, from any drug store.

The following is a list of various appliances not included in the list already given:

6	Wooden Spoons.
2	lbs. of assorted glass rods or stirrers.
1	lot of soft wood and hard wood square pieces for testing Varnish.
1	lot of common window glass, for the same purpose.
1	Glue pot.
1	pair of scissors.
1	small steel hammer.

The above can be procured at a low price right in your city.

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